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FOR ENGINEERS AND CONTRACTORS CONTROLLING THE DESIGN, SPECIFICATION, INSTALLATION AND MAINTENANCE OF HEATING, VENTILATING AND AIR CONDITIONING.

HEATING & VENTILATING
AIR CONDITIONING

FOR JANUARY, 1939

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USING THIS ISSUE!

This issue, HEATING & VENTILATING'S 6th Annual Yearbook of Progress, is divided, like the several previous editions, into four major parts. The first, or Winter Section, which begins on page 29, reviews the technical accomplishments of the year in, as well as statistics on, winter heating and humidifying equipment.

The second, or Summer Section, begins on page 67 and is devoted to methods and equipment designed for use in the summer and which accomplish either cooling or dehumidifying or both.

The third section, which begins on page 89, covers equipment which has Year-Round applications or cannot be classified as either summer or winter, while the last section, which begins on page 113, is devoted entirely to Controls and Instruments.

Each of these sections includes a review of the year's new equipment in that particular classification.

Current material, consisting of the regular monthly departments, begins on page 129.

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VOLUME 36 NUMBER 1

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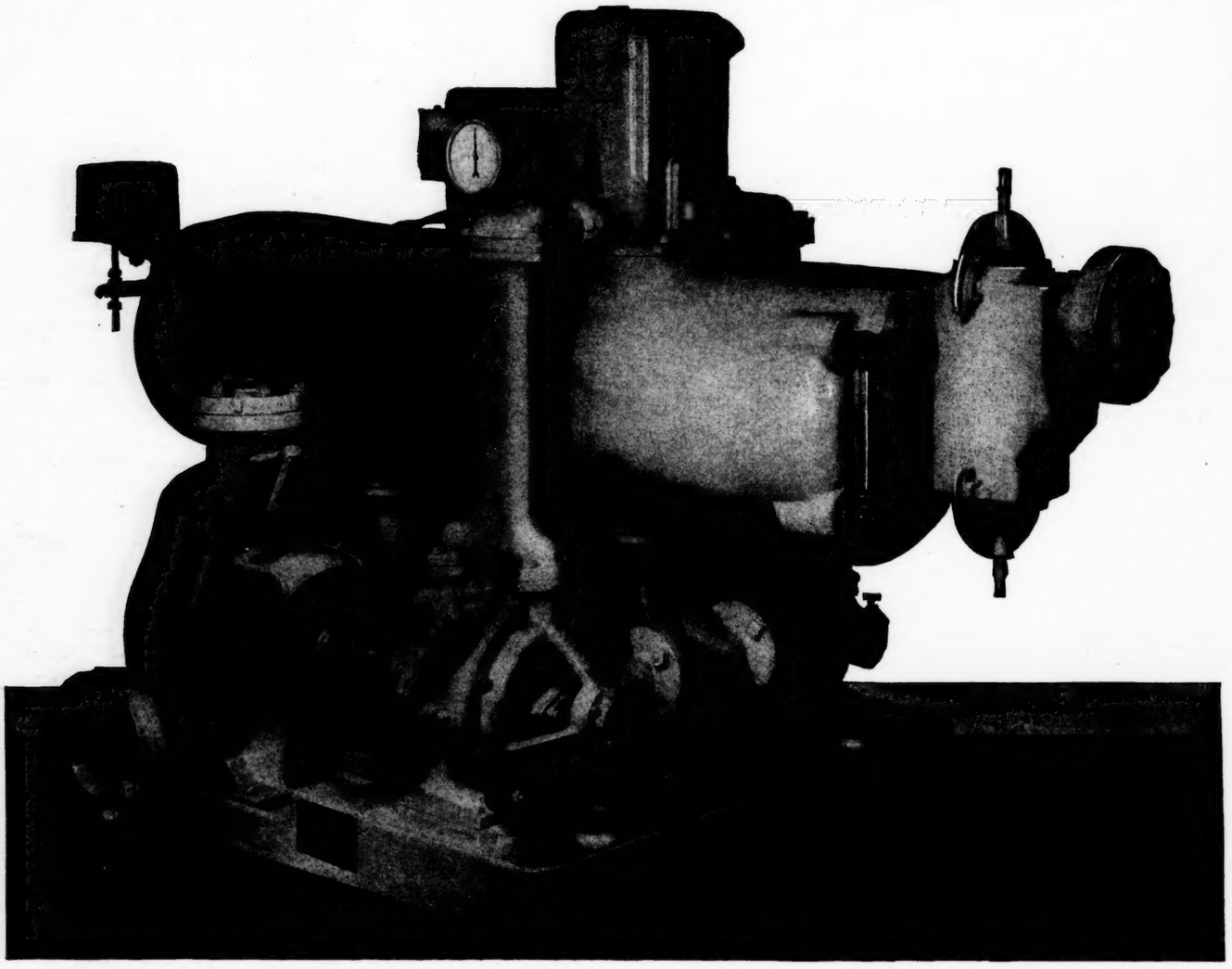
Where Heat Must Not Fail— Install this SAFE Heating Pump!



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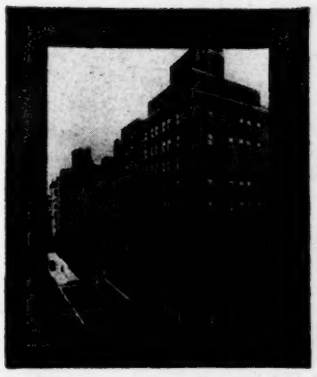
1939 Building to Be Up 30%

Predicts L. Seth Schnitman, Consulting Economist



Building

NOT in ten years has the outlook for new building construction, modernization work and maintenance for existing buildings been so promising as it is at this time. Viewing the prospects for the country as a whole, 1939 seems destined to provide a new building total of approximately $3,500,000,000, both urban and rural, farm and nonfarm. Add to this an item of about $1,300,000,000 to cover the probable amount of maintenance work to be performed as relates to existing buildings, the country over, and the 1939 vista so far as building is concerned is at once complete.

What does this mean? Besides indicating the magnitude of the probable volume of building activity in the current year, such a performance would mean a gain over 1938 in new building alone of between $800,000,000 and $900,000,000, for an improvement of not less than 30%. True it is, some of this betterment, unless all present signs fail, will stem from enlarged expenditures by public agencies, Federal, state and local; but the incidence of this element is not likely to be nearly so important as many might imagine—at least not so far as building is concerned. As to heavy engineering types that is something else again but henceforth we will consider only the building side of the construction picture. In passing, however, it is well to point out that on present indications, fully $700,000,000 of the indicated gain in new building will occur in private operations, as distinguished from public enterprises. And of this $700,000,000, better than $500,000,000 will be traceable to improvement in residential building, as differentiated from private nonresidential building types.

Unfortunately, no overall current statistical series is available, by which one may check the indicated pattern against actual performance. That being so, let us consider henceforth only the statistics periodically compiled by F. W. Dodge Corporation on the so-called contract award basis, covering the flow of new and alteration building projects above a certain minimum value in the 37 eastern states from blueprints to actual construction. On this basis, the 1939 building outlook, exclusive of engineering, shapes up about like this: A total of between $2,400,000,000 and $2,500,000,000, almost evenly divided between residential and nonresidential types, with residential having the slight edge. And even this indicated volume of new and alteration work is a total large enough to be of special moment to all interested directly in the building field, if not indeed to everyone in any wise interested in the outlook for industry generally. And what does the outlook, on the Dodge basis, mean?

Besides indicating a gain in total building in the 37 states east of the Rocky Mountains over the 1938 total in the same area of somewhere between $400,000,000 and $500,000,000, such a performance would mean an increase of at least 20% and possibly as great as 25%. And regardless of what benchmark may be used to view the 1939 prospects it is all but certain that the present year will show the greatest building volume of any year since 1930. For residential building alone, it is likewise all but sure that 1939 will see greater volume than has been seen since that fateful New Era year, 1929.

As always, significant swings in building activity rest upon the following major factors: Building costs, rent levels, the national income, availability of mortgage money at acceptable or profitable interest rates, on population shifts and growth, to say nothing of other factors that have varying influences on the extent and amplitude of the building cycle itself, which still has some distance to travel before a major reversal overtakes it.

How then do these factors look at this time? Building costs today are slightly under the levels that prevailed a year earlier. This, for the coming year, is favorable factor Number One, for no item is of as much influence on year-to-year changes in new building volume as is the element of costs. And especially is this the case in the residential building field. But even the factor of costs is a relative matter, as indeed are the other important elements that impel the building cycle in its unrelenting transit from trough to peak. It is only when costs are in consonance with rentals and the state of personal incomes and

The author, L. Seth Schnitman, formerly Chief of Division of the Department of Commerce "Survey of Current Business" and more recently chief statistician F. W. Dodge Corp., is now a consulting economist in New York. Last year in the January issue of HEATING & VENTILATING he predicted the building volume for 1938 with surprising accuracy. He was also correct in his prediction that building volume in 1937 would not reach boom proportions, a prediction in which he stood almost alone but which was amply borne out by events. His present prediction regarding prospects for the coming year can therefore be taken as a good advance indication of what we have to expect for 1939, namely, the "greatest building volume of any year since 1930"

TABLE 1—VOLUME OF URBAN NEW BUILDING CONSTRUCTION IN THE 37 EASTERN STATES
(Figures in Millions of Dollars)

Year	Grand Total	Houses	Apartments and Hotels	Commercial	Factories	Public and Institutional
1929.....	$4,292	$1,081	$835	$929	$546	$901
1930.....	2,859	707	394	616	256	886
1931.....	1,921	574	237	311	116	683
1932.....	761	233	47	123	44	314
1933.....	653	185	64	99	127	178
1934.....	792	185	64	151	116	276
1935.....	1,154	361	118	165	109	401
1936.....	1,755	603	199	249	198	506
1937.....	2,053	681	224	297	314	537
1938 (Est.)...	2,000	755	215	230	145	655
1939 (Est.)...	2,480	886	394	255	220	725

Source: F. W. Dodge Corporation. 1938 and 1939 estimates are by L. Seth Schnitman. Above figures do not include all low-cost projects, especially in the housing field, nor do they include building projects on the farms within the area covered. For the most part the data represent building jobs undertaken under contract and do not include all projects done by day labor or under so-called force account. While they include some modernization or alteration work, they do not include all such work done.

the national income generally that the stage may be said to be set for a rise in building activity. Such in fact is the case today, where because of the mending conditions in business and industry we are witnessing an improvement in income and a firmer level of rentals. Add to these things the fact that mortgage money is now available on terms and rates never before seen, thanks to the easy money policy of the Federal government and especially to the liberal mortgage facilities set up by the Federal Housing Administration, both as respects small dwellings and large-scale rental housing projects, and the picture is all but complete. One new influence remains, so far as housing is concerned, though others will be later touched on, especially because of their incidence on nonresidential building.

Already we have seen the Insurance Code of the State of New York amended so as to permit so-called domestic life insurance companies to invest up to 10% of their total assets in housing enterprises on a pure equity basis—constructing, owning and managing same for rental income as distinguished from their former universal practice of mortgage financing. This development means a potential of roughly $1,500,000,000 of new private construction from this one source alone —not, of course, for the present year, but for the indeterminate future. Already the Metropolitan Life Insurance Company has embarked upon one such project in the Borough of Bronx, New York, involving an investment of some $50,000,000, on a pure equity basis for rental income. What is more, this same company has under consideration several other locations in other boroughs of the city, chiefly in Brooklyn and Queens, while other life companies, too, are actively surveying the possibilities of similar projects. Even more important is the possibility that such undertakings, presently to be proved successful, may open up similar opportunities to the mutual savings banks, the vaults of which are bulging with monies "no place to go." Obviously such would require enabling legislation, but, with continuing pressures of low interest rates on fixed-income securities—the types alone now open for investment to savings banks—the enactment of the necessary law does not appear to be too far off, if there is real will to grapple with the housing problem on a soundly-conceived basis. Legislatively, the lead of New York State, as to insurance companies, may be confidently expected to be followed in some of the other important insurance states: Massachusetts, Connecticut, New Jersey, Pennsylvania, Ohio, Illinois, Wisconsin.

Superimpose upon this potential substructure of equity finance and the FHA mortgage system now in existence, a combination of equity and mortgage finance on the part of our corporations, the utilities, and even ultimately the railroads, and there is opened up a whole new frontier for the construction industry as a whole, wherein new structures of every description will rise to meet both the quantitative needs of our people and their qualitative tastes arising out of a renewed consciousness on the all-impelling questions of obsolescence, slums, rehabilitation and even replanning.

Residential Building Prospects

Before looking at nonresidential building prospects let us take a glimpse of the residential outlook for 1939 in greater detail. Of the indicated total for the 37 eastern states of not far below $1,300,000,000 as against about $970,000,000 for 1938, about $400,000,000 seems destined to go into apartment and hotel types, chiefly the former, with the remainder going into small dwellings, chiefly of the one-family variety. For the apartment and hotel classification, such a performance would mean an increase over 1938 of not far from $150,000,000, or roughly 60%, traceable as much to private enterprise as to public housing, now gaining stride. For the one-family dwelling type, the indicated total for 1939 of somewhat better than $815,000,000, on the Dodge basis, means an improvement over the 1938 total of at least $150,000,000 or a minimum of 20%. In both instances the bulk of the expected gains will occur in the first half of the year.

Localizing the residential outlook we find that all major geographic sections promise to share in the general indicated improvement, with the greatest incidence

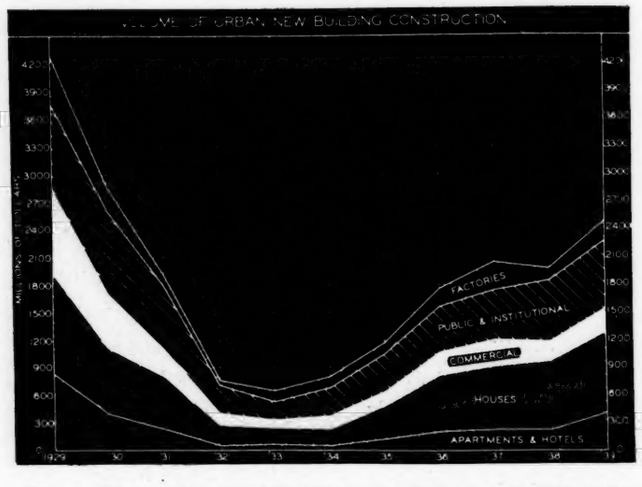


Fig. 1. The major classifications of urban new building during the past decade. This division of building projects is estimated for 1938 and 1939.

TABLE 2—ESTIMATED VOLUME OF PRIVATE NEW BUILDING CONSTRUCTION IN THE UNITED STATES† (Exclusive of Utilities. Figures are in Millions of Dollars)

1930	$4,429
1931	2,765
1932	1,308
1933	851
1934	882
1935	1,266
1936	1,996
1937	2,400
1938 (Est.)	1,925
1939 (Est.)	2,600

†Figures for 1930 through 1937 are from the report by Lowell J. Chawner, U. S. Department of Commerce. Preliminary estimates for 1938 and 1939 by author. Figures include all new private bulidings, both residential and non-residential, additions and alterations, but not maintenance, both urban and rural the country over.

occurring in the Middle Atlantic States (New Jersey, New York, Pennsylvania) which should account for virtually one-third of the year's total and a gain over the corresponding total for housing in 1938 of almost 35%.

Next in importance are the East North Central States (Illinois, Indiana, Michigan, Ohio and Wisconsin). For this area the volume of residential building during 1939 should amount to approximately $285,000,000, representing somewhat more than one-fifth of the housing total for the 37 states as a whole and a likely gain over the comparable figure for 1938 of better than 30%. Both as respects the Middle Atlantic States and the East North Central area, public housing will have much to do with the indicated gains over a year ago.

For the South Atlantic region (Delaware, the District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia and West Virginia) the prospects are for a 1939 housing volume of about $225,000,000, for a gain of not far from 30% over the 1938 total. The remaining areas are relatively of lesser importance, though appreciable percentage increases over their respective totals of last year seem all but sure. For the Pacific Coast States (California, Oregon, Washington), as computed from the less accurate permit figures to give effect to the probable contract basis covering the area east of the Rocky Mountains, the 1939 outlook is for a total of about $225,000,000, for an estimated increase over 1938 of a little more than 20%.

In arriving at these territorial estimates, chief emphasis has been given to the prospects of income in the respective regions, upon known facts as to the inventory of unsold houses built by operative builders during 1938, upon the elements of local building costs and rental relationships, upon the influence of public housing.

Approximately 230,000 individual family dwelling units of all descriptions will be constructed in the area east of the Rocky Mountains (Dodge basis of coverage). Of this estimated total about 90,000 will represent units in multiple-family buildings and apartment houses, about 130,000 in single-family dwellings, with the remaining 10,000 in two-family houses. Of the estimated number of single-family houses, about 30,000, or 23% of the total, will have unit building costs under $4,000 with the remaining 77%, or 100,000, to have unit building costs of $4,000 and over. Of this latter category, about 5,700 houses will involve unit building costs of $15,000 and over.

One last word: Residential building on the nation's farms in the 37 eastern states (not reported in Dodge statistics) in 1939 will approximate $90,000,000 additional, while $13,000,000 more must be added to round out the picture of farm housing prospects to take care of the 11 western states.

Nonresidential Prospects

We are now ready to view the prospects for nonresidential building. For the year 1938, nonresidential building represented about 52% of the total volume of building in the 37 eastern states, exclusive of civil engineering, while residential building represented the remaining 48% of the total building volume in this area. This does not mean that nonresidential building is the more important, since it is residential building that usually impels the building cycle and gives it shape and amplitude, in that it is, in its regenerative influences, far closer to the consumer than is nonresidential building.

For all classes of nonresidential building, on the Dodge basis of coverage, the 1939 volume will be not far from $1,200,000,000. This represents an indicated gain of better than 15% over the 1938 total of about $1,030,000,000. The bulk of the indicated gain for the year will likely occur in the initial half of the year.

Of the 1938 total about 45% was financed out of public treasuries, Federal, state and local. In 1939, public undertakings will likely represent as much as 60% of the indicated nonresidential total. In the sphere of private work, commercial building and factories account essentially for the large bulk of the total.

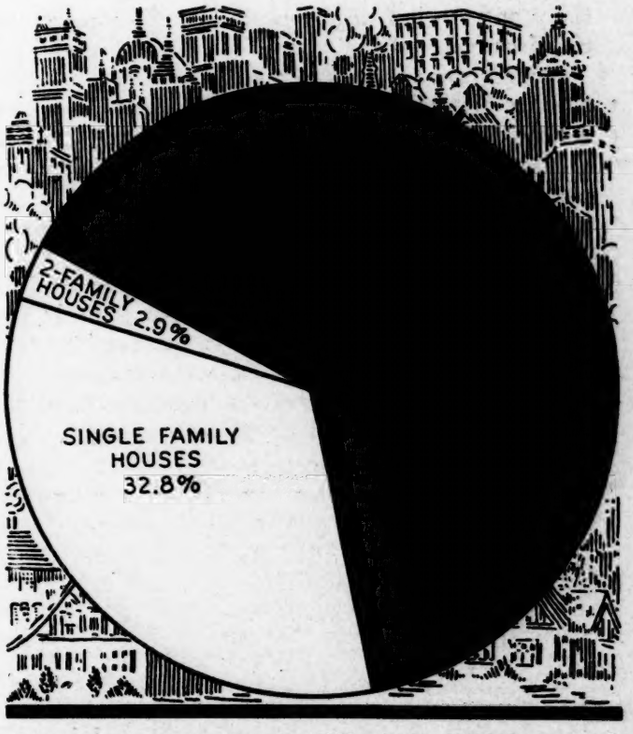
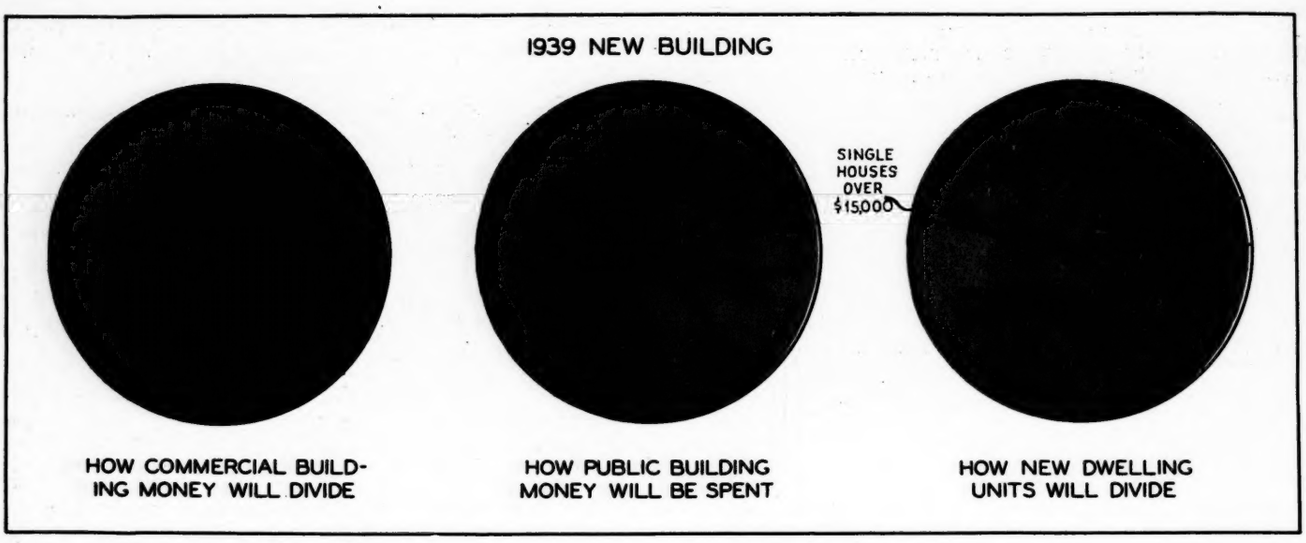


Fig. 2. How new building in 1939 will be divided among the major building classifications. Note that the majority of building will be in other than houses.


1939 NEW BUILDING
SINGLE HOUSES OVER $15,000
HOW COMMERCIAL BUILDING MONEY WILL DIVIDE
HOW PUBLIC BUILDING MONEY WILL BE SPENT
HOW NEW DWELLING UNITS WILL DIVIDE

We may now examine the prospects for these important groups of private nonresidential building.

For commercial building, the 1939 volume will approximate $255,000,000 (Dodge coverage) as compared with an estimated total for 1938 of $230,000,000; this is an indicated gain between the two years of about 10%. In this classification are included garages and service stations, bank buildings, office and loft buildings, store buildings of every description, and commercial warehouses. During 1938, store building operations, new and alteration, accounted for about 44% of the total for all commercial structures; during 1937, the ratio was 45%. No appreciable change in this ratio looms for 1939. However, the aggregate volume of store building will be greater than in 1938 and lower than in 1937, with the probability of a 1939 volume of at least 15% greater than the estimated total for 1938 of $85,000,000.

Office and loft buildings constitute another important class of commercial building. This class of operation in 1938 represented virtually one-fourth of the commercial total; incidentally, of all significant classes of commercial building this category suffered the smallest decline from the 1937 aggregate, due chiefly to special conditions in New York City. No great extension in the volume of office and loft building operations, however, looms for 1939, though the total should be somewhat better than in 1938.

Still another important subclass of commercial building is represented by commercial garages and service stations. This type during 1938 accounted for about one-sixth of the commercial building total, about maintaining the ratio set in 1937. Though no material change in the percentage appears probable for 1939, the aggregate volume for this class of building will likely exceed the 1938 total by at least 15%, almost reaching the 1937 figure of $48,000,000. Commercial warehouses in 1938 suffered a severe loss in volume, a natural result of the drastic decline in industrial activity and consequent lowered occupancy ratios of commercial storage facilities, as drafts on inventory accumulations tended to increase with the industrial slackening. With less than 40% of the building volume of the preceding year, this class should in 1939 show a resumption of building activity; but it is dubious if the volume can attain to the level of even 1935, without stimulus from the coming National Defense Program —such as might arise out of the need for warehouse facilities for the storage of implements and necessities of war.

TABLE 3—ESTIMATED TOTAL BUILDING VOLUME BY REGIONS†
(Residential and Non-Residential. Figures are in Millions of Dollars)

Region	1939	1938
New England	$205	$160
Middle Atlantic	810	650
South Atlantic	395	325
East North Central	535	430
East South Central	115	90
West North Central	195	160
West South Central	225	185
Mountain	55	45
Pacific	400	325

†All estimates adjusted to the Dodge basis of coverage. Also see Table 1.

Factory Prospects

This brings us to a consideration of factory building prospects. By contrast, with either 1936 or 1937, the year 1938 was a pretty poor period of factory building. The shrinkage in 1938 from 1937 was in excess of 60% while the loss from 1936 approximated 40%. Fully as much because of this loss as because of the improving industrial outlook and the added influence of the probable Defense program, it seems reasonably safe to count upon an increase in factory building in 1939 over 1938 in excess of 50%. This would mean a total for the 37 eastern states of about $220,000,000 as against about $145,000,000 for 1938. In arriving at this figure proper weight has been given to the bettering industrial conditions, the slowly mending situation in the capital markets, the revision in the capital gains and undistributed profits tax structure, the possibilities inherent in the coming Defense program and many lesser items. So much for the essentially private types of nonresidential building.

Public Buildings

What of public and quasi-public nonresidential building types? No subclass under this general heading is

ot the importance of educational building, which in 1938 not only exceeded the 1937 figure but represented 25% of the nonresidential total, and was roughly 40% of all public and quasi-public nonresidential building. For 1939 educational building will, in all likelihood, better both ratios, with the probability that the year's total will exceed by at least 40% the 1938 figure of about $260,000,000.

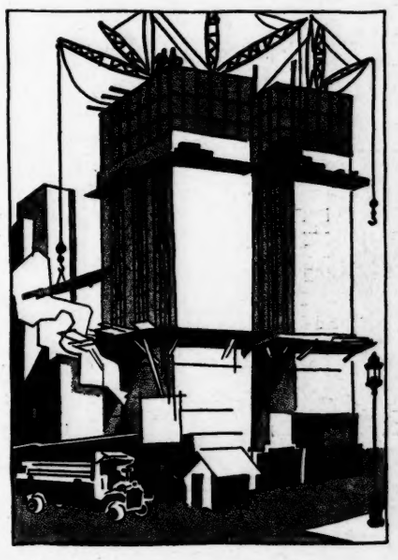
Next in importance in 1938 were social and recreational buildings and hospital and institutional structures, each representing something better than 10% of all nonresidential building as a whole and almost 20% of the total for public and quasi-public types separately. Both social and hospital buildings in 1938 were erected in larger volume than in 1937. Some further gains lie ahead for these two classes for 1939, estimated at slightly in excess of 10%.

Public buildings, dominated chiefly by administrative office buildings, post offices and jails, were undertaken in 1938 on a slightly reduced scale, as contrasted with 1937. But 1939 promises to witness a resumption of the forward move, principally in the field of arsenals, powder magazines, armories, and post offices. For public buildings as a whole the 1939 total for the 37 eastern states should approximate a gain of better than 25% over the 1938 total of about $100,000,000.

Religious buildings, chiefly churches, constitute a relatively insignificant class of nonresidential building as a whole. For 1938 this subclass was less than 5% of that total and only about 7% of the total for public and quasi-public types separately. In neither of these respects do any significant changes appear probable for 1939, nor does any important increase in the actual volume of religious building operations loom for 1939. Whatever gain does occur will probably be less than 15%.

Adding all this up, it appears that the volume of public and quasi-public building in the 37 eastern states in 1939 will approximate $725,000,000, this as against the 1938 total of about $655,000,000. Such a performance would mean an improvement of about 12½%.

Coming now to estimates of the geographical distribution of nonresidential building as a whole, attention should once again be directed to the prospects in the Middle Atlantic area. Here, the 1939 estimate indicates a total of about $400,000,000, this as contrasted with a total of about $340,000,000 for 1938. Next come the East North Central States, for which the 1939 estimate is $250,000,000 as against a 1938 total of about $210,000,000. For the South Atlantic region the 1939 prospects indicate a total of about $170,000,000 as compared with a 1938 total of about $145,000,000. Skipping over all other districts and going out to the West Coast, we find an estimated 1939 nonresidential building volume of about $175,000,000 as contrasted with about $140,000,000 for 1938. Considerable of the estimated increase in this latter area, if it occurs at all, will stem from increased construction of armories, arsenals, navy yard facilities and the like.



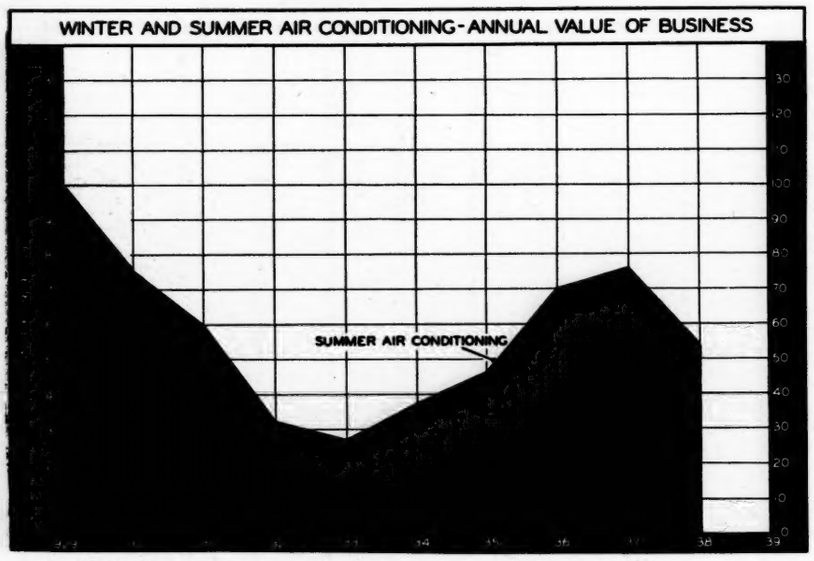
In arriving at territorial estimates, approximations of areal incomes held first place in the weighting of all factors considered. Reasonable weightings were given to the significant business, industrial and agricultural elements respecting the individual districts. In addition, as already noted, the possibilities of the Defense program have been evaluated and weighted by specific regions, where incidence was found to be of likely importance.

Building Costs

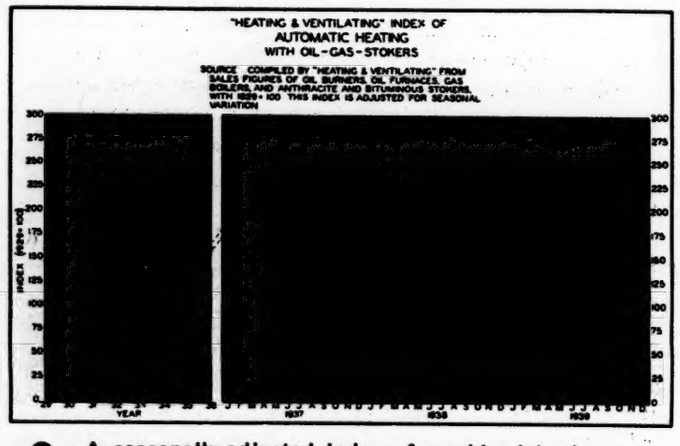
What about 1939 building costs? Will there be any upheavals in materials and labor that may bring about stifling rises in the cost of building? Probably not; the Monopoly Inquiry will see to that so far as materials are concerned, though on the labor front some hardening in given communities may be counted on to develop after midyear. In sum, building costs in 1939 will be relatively little changed from the average level of 1938, though a general advance of as much as 5% should occasion no surprise. Unless all signs fail, relatively high building costs as such will be less of a deterrent to building improvement than was the case in 1937, for the current gains in business, industry and the national income cannot now be said to have entirely spent themselves, even though we must still recognize the need for relief on the whole question of taxes, especially local real estate taxes and the need for restoring to private payrolls some ten million idle hands now feeding at the public watering-trough.

For before 1939 will have passed into history most of the stimuli of the current spending-lending program will have gone the way of its predecessors with the added heritage of an accumulating debt-load and probable rises in taxes to meet it. And what is of equal significance is the virtual certainty that before 1940 rolls around the nation will have been irretrievably committed to the broadest program of National Defense in peace-time history—all of which, too, must cost the public much money that, but for the inordinately mad scramble for a place under the sun by nations abroad, could more profitably be employed in rebuilding an obsolescent America. Bearing these points in mind, it should occasion little surprise to note in conclusion that regardless of the actual extent of the 1939 building improvement there is little in the current outlook that warrants the opinion that the year will witness boom conditions, if by the term is meant an early return to the building levels of the middle 1920s. Too many obstacles still stand in the way, with all too little prospect that these can be cleared away this year.

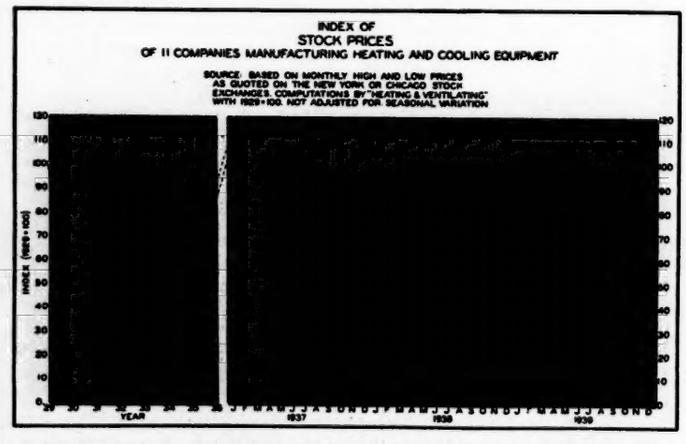
Key Statistical Indexes Indicate



1 The combined trend of summer and winter air conditioning. The fluctuations in the winter air conditioning are based on the annual variations of HEATING & VENTILATING's Index of Heating Business Activity, while those in summer air conditioning are based on reports from electric utility companies. The base is 1929 = 100.



3 A seasonally-adjusted index of combined business in oil burners (conversion burners, boiler-burner units, and furnace-burner units), heating stokers, and central gas burning equipment. The base is 1929 = 100.



4 Trend of common stock prices of 11 industrial firms, most of which manufacture nothing but heating and air conditioning equipment. The base is 1929 = 100.

All signs and portents indicate more volume of business for 1939. The use of graphics is followed throughout this issue, but here on these two pages are assembled a few charts which bring out the chief features. Study them first, then turn to the several following sections where more detailed information is presented.

Chart 1 probably gives as complete an overall picture of the ten-year trend in this industry as it is possible to obtain with a single graph. Note that during the years 1929 to 1933 the dollar volume of summer air conditioning was nearly steady. While this volume was practically steady, it should be noted that whereas summer air conditioning represented only 1.4% of the total in 1929 it had increased to 6.2% of the total in 1933, due entirely to the shrinkage in the volume of heating business during that period. From 1933 to 1937, summer air conditioning gradually expanded in volume with each passing year. In 1938, however, the dollar volume of summer air conditioning showed a definite decrease from the previous year.

A somewhat different picture of the change in the relative dollar volume of summer air conditioning in the total can be obtained by noting the variations experienced by each of the two major divisions since the low volume year of 1933. In that year summer air conditioning represented 6.2% of the total; in 1938 it represented 8.8% of the total. Compare this with 9.2% in 1934; 11.1% in 1935; 8.4% in 1936, and 10.4% in 1937. Another way of making this same comparison is to note that between 1933 and 1938 the volume of summer air conditioning has tripled, while during that same time winter heating and air conditioning has doubled.

Throughout this issue appear nearly forty charts, most of which are plotted on an annual basis. The exceptions are charts 2 to 6 which show the trend by months of five important statistical series. These monthly charts are naturally more sensitive in that they show to the month when advances and recessions begin and end.

The heating business is a seasonal one, with the peak in October and the nadir about March; this pattern repeats itself each year in uncorrected statistics of the heating business. However, Charts 2 and 3 are both adjusted for this seasonal variation, and an increase (or decrease) in these indexes is one entirely independent of a normal seasonal increase (or decrease).

Chart 2 is a plot of the Index of Heating Business Activity together with a monthly index of general busi-

Favorable Prospects for 1939

ness, including cotton mill activity, steel production, carloadings, electric power production, lumber sales and automobile production. In general, the heating business curve follows the general business curve but usually lags behind it; the amplitude of the swing from high to low is, however, less for general business since this curve is balanced by activity in several basic industries.

General business, as shown, reached its low for the year early in the summer of 1938; apparently the heating curve low, when final figures are in, will be that for August, 1938. Since summer, general business has gradually increased and, if heating business follows historical precedent, this should be followed by an increase in the heating curve. Additional evidence for this assumption is found in the forecast for new building in 1939, outlined on the preceding pages, where an increase of 30% is predicted.

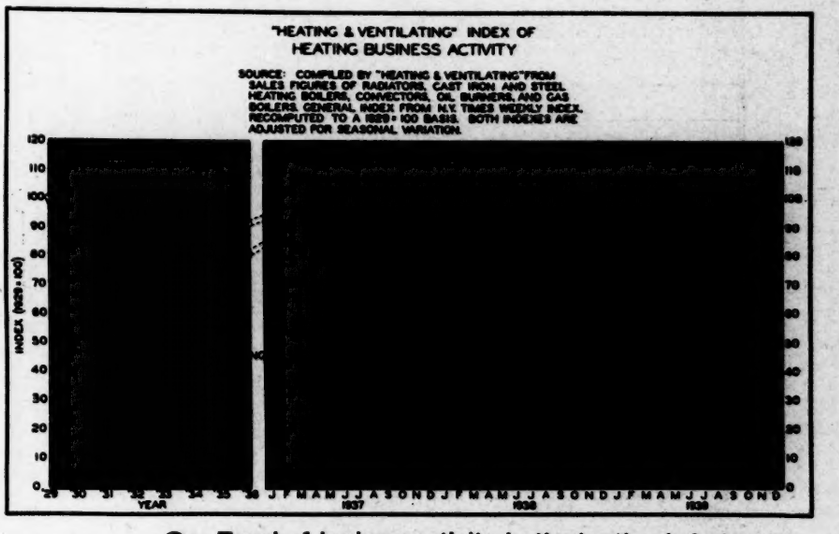
It is of interest to note how heating business lags behind the stock market. The Index of Stock Prices (Chart 4, covering prices of stock in firms making heating equipment) reached a high in January, 1937; heating business, as reflected by the Index of Heating Business Activity, lagged two months and reached a peak in March. Stocks declined to a low in March, 1938, while the heating business reached its low in August. Since March the market has been generally increasing; heating business will probably follow.

The Index of Automatic Heating (Chart 3) is intended to reflect business activity in oil burners, gas-fired heating and stokers. This index is adjusted for seasonal variation. Further information about automatic heat will be found in the following pages.

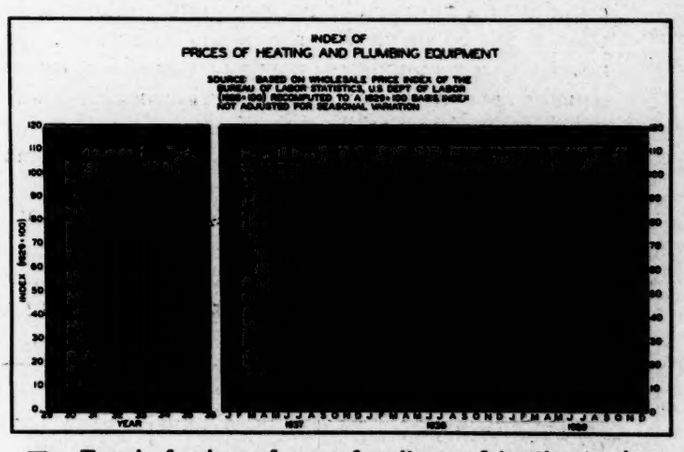
Chart 5 is a wholesale price index based on only a few components (square and round boilers and cast iron radiators) but it is the only price index available in the industry. This index indicates a steady price situation since 1936.

Employment in manufacturing plants has been slowly increasing since January, 1938, according to Chart 6.

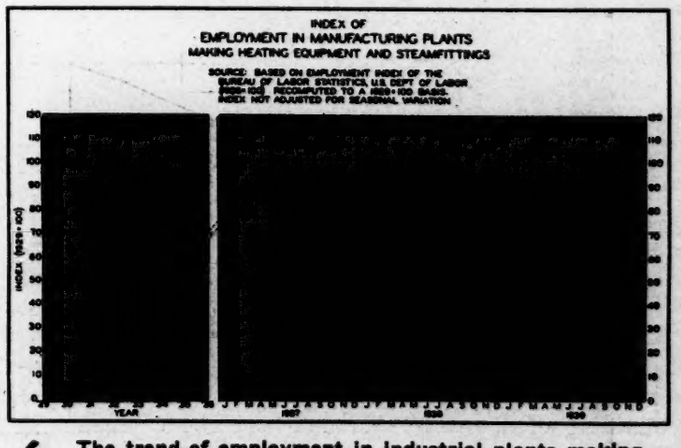
The cooperation of the following organizations in furnishing statistics used directly or indirectly throughout this issue is acknowledged: U. S. Department of Commerce; Bureau of Labor Statistics, Department of Labor; Association of Gas Appliance and Equipment Manufacturers; National Warm Air Heating and Air Conditioning Association; American Gas Association: The New York Times: F. W. Dodge Corp., and numerous electric utility companies.


"HEATING & VENTILATING" INDEX OF
HEATING BUSINESS ACTIVITY
SOURCE: COMPILED BY "HEATING & VENTILATING" FROM SALES FIGURES OF RADIATORS, CAST IRON AND STEEL HEATING BOILERS, CONVECTORS, OIL BURNERS, AND GAS BOILERS. GENERAL INDEX FROM N.Y. TIMES WEEKLY INDEX, RECOMPUTED TO A 1929 = 100 BASIS. BOTH INDEXES ARE ADJUSTED FOR SEASONAL VARIATION.
INDEX (1929 = 100)
YEAR
1937
1938
1939

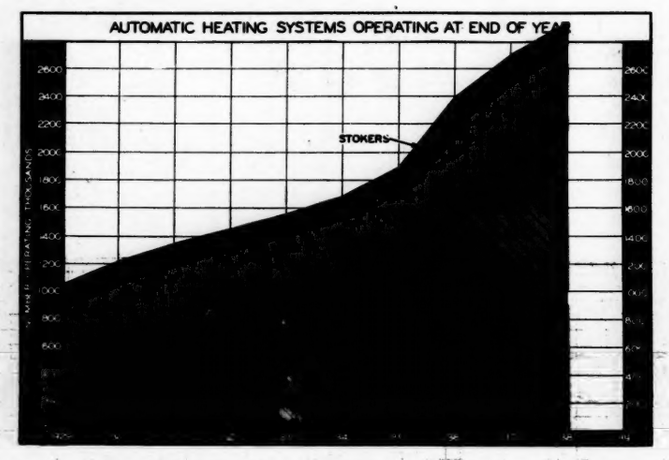
2 Trend of business activity in the heating industry as compared with general industrial and merchandising activity. Both indexes are seasonally adjusted, with 1929 = 100. Heating business curve does not include summer air conditioning.



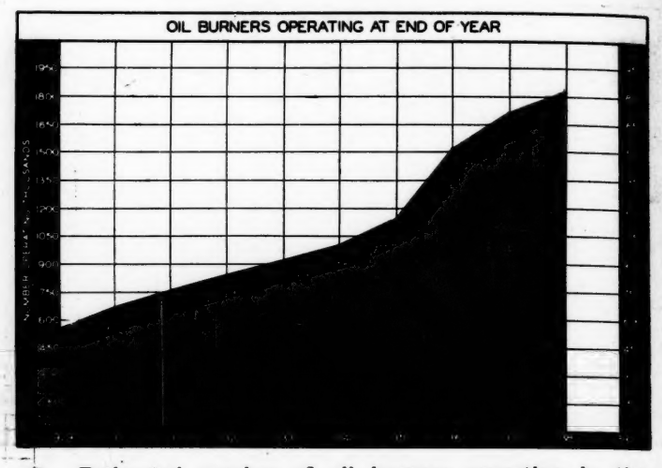
5 Trend of prices of some few items of heating equipment—round boilers, sectional boilers and radiators. The index is that of the U. S. Bureau of Labor Statistics converted to a 1929 = 100 base.



6 The trend of employment in industrial plants making heating apparatus and steamfittings. The curve is based on the U. S. Bureau of Labor Statistics index, converted to a 1929 = 100 base.



7 Estimated number of automatic heating installations operating at the end of each year, totaling the estimates plotted in Charts 8, 9 and 10.



8 Estimated number of oil burners operating in the U. S. at the end of each year for the heating of buildings. Allowance is made for burners removed.

Automatic Heating

The story of the rapid growth of automatic heating constitutes a spectacular chapter in the industrial history of this country. The rise of the oil burner from a novelty to a commodity is now a matter of history; the equally amazing increase in stoker business is a story still being written, while that of gas heating has been a slow but steady expansion with, probably, the zenith of its production curve lying in the future.

During 1938 over a quarter of a million automatic heating installations were made, as follows:

ESTIMATED NUMBER OF RESIDENTIAL INSTALLATIONS OF AUTOMATIC HEATING

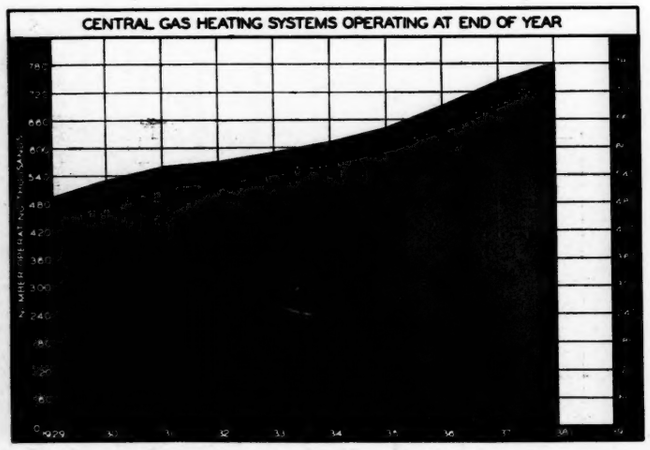
Type	1938	1937
Oil	137,700	204,000
Stoker	80,000	85,000
Gas	36,700	55,000

Since annual sales fluctuate, naturally, from year to year depending on business conditions, the sales by years of these equipments is somewhat erratic viewed in such a light. Perhaps a better picture is obtained by studying the graphs on this page, which show the number of these systems believed to be operating each year.

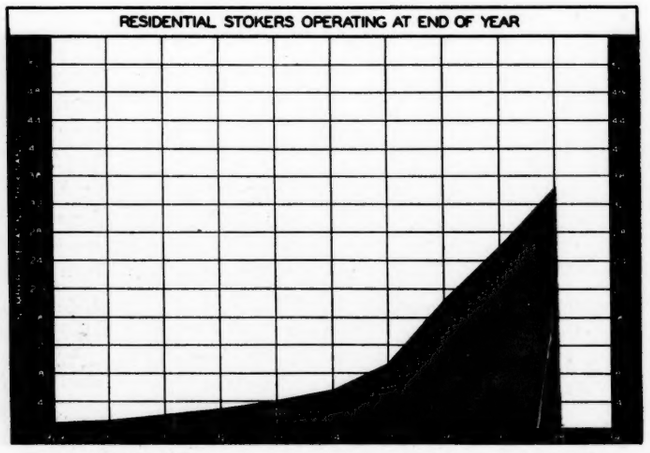
Chart 7 shows the number of automatic heating systems operating each year, the graph being divided into three subdivisions for oil, gas, and stokers. This graph shows that of the automatic heat jobs now operating about 60% are those burning oil.

There are now in operation very close to three million automatic heating installations and of these, as shown in charts 8, 9, and 10, about three-quarter million are gas; one and three-quarter millions are oil, and one-third million are stokers. The last has increased with extreme rapidity in the last six years.

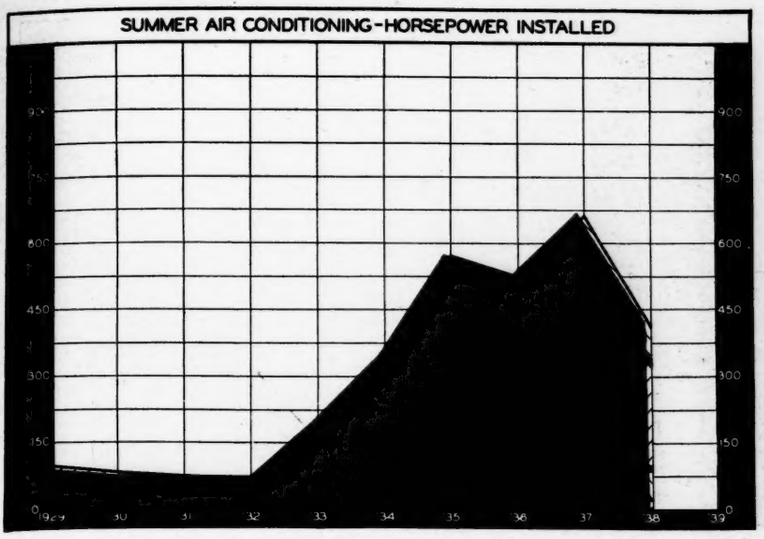
Further information and charts relating to automatic heating sales will be found in the Winter Section.



9 Estimated number of central type gas heating plants operating at the end of each year, including gas designed boilers and furnaces and conversion burners.



10 Estimated number of residential heating stokers operating at the end of each year, including both anthracite and bituminous burning units.



11 **An analysis of the trends of summer air conditioning in different types of buildings and in railroad cars for recent years. Figures are based on reports by large electric utilities and adjusted to estimate the total volume throughout the country.**

SUMMER AIR CONDITIONING

For the first time since summer air conditioning really got under way in 1933, air conditioning in buildings has decreased. The 1938 figures show a decline of 40% from 1937.

Chart 11 shows clearly the tremendous growth of summer air conditioning over the 10-year period from 1929-38, with the greater part of the growth in the last six years.

In 1938, as compared with the previous years, declines took place in all of the major classifications, including that of railroad cars.

While the chart shows the division of summer air conditioning business by type of building in which it was installed, it gives no clue to the type of equipment which was installed. The following table, based on manufacturers' reports (dollar volume) to the Department of Commerce, answers this question:

TYPE OF SUMMER AIR CONDITIONING EQUIPMENT INSTALLED IN 1938

Type	Per Cent
Self-contained units	30.6
Non self-contained units	30.2
Central systems for comfort	34.6
Central systems for industrial units	4.6
	100.0

In interpreting the chart it should be noted that the figures cover only business done in the United States and do not include exports.

Further summer air conditioning statistics will be found in the Summer Section.

HEATING BUSINESS IN NEW AND OLD BUILDINGS

The word "modernization" was popularized only a few years ago and has not been particularly stressed recently. Nevertheless, a substantial part of the business of the heating industry has been due to modernizing—in all its phases—for a good many years; furthermore, a great part of the total business is still in modernizing, repairs, and replacements.

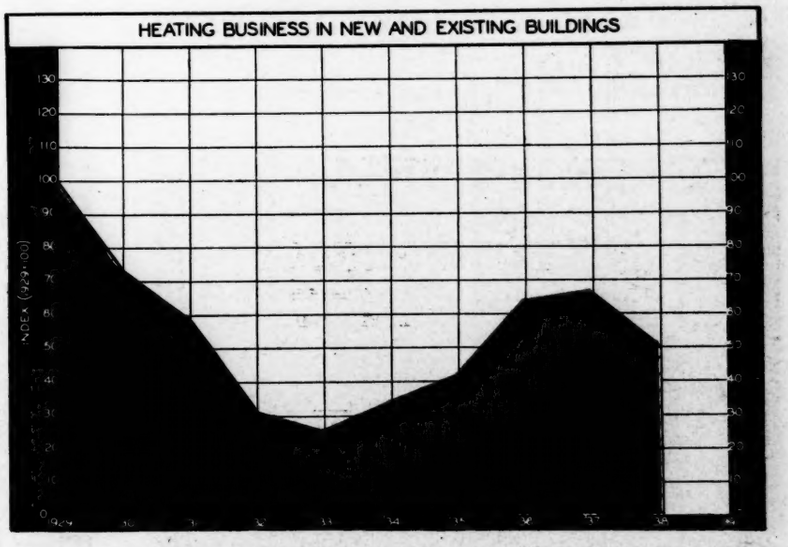
Chart 12 has been prepared to show how the total heating business is divided between that originating in new building construction and that in existing buildings.

Over the decade ending with 1938, the division of business fluctuated as follows:

Year	Per Cent of Total Heating Business	
	From New Buildings	From Existing Buildings
1929	67	33
1930	58	42
1931	49	51
1932	35	65
1933	39	61
1934	35	65
1935	43	57
1936	43	57
1937	48	52
1938	60	40

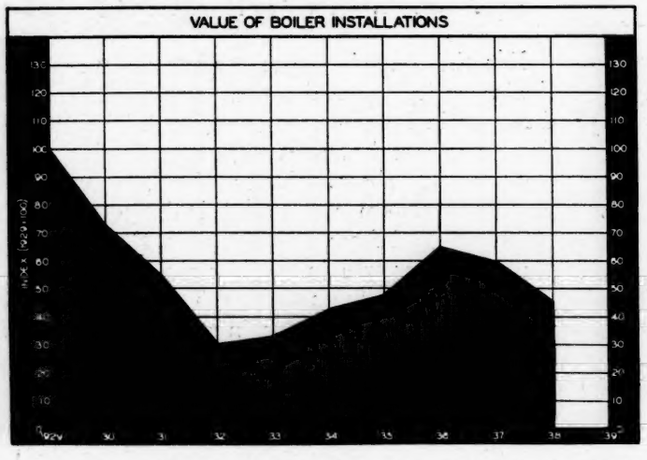
The sum of the two columns in this table totals 100%. The table brings out clearly that 1938 was the first year since 1929 that modernizing accounted for as low as 40% of all heating business. The peak was reached in 1932 and 1934, when 65% of the total was that from existing buildings.

The 1938 figure shows that once again the emphasis was on new buildings. Perhaps the cream has been taken off the existing building market for the present.

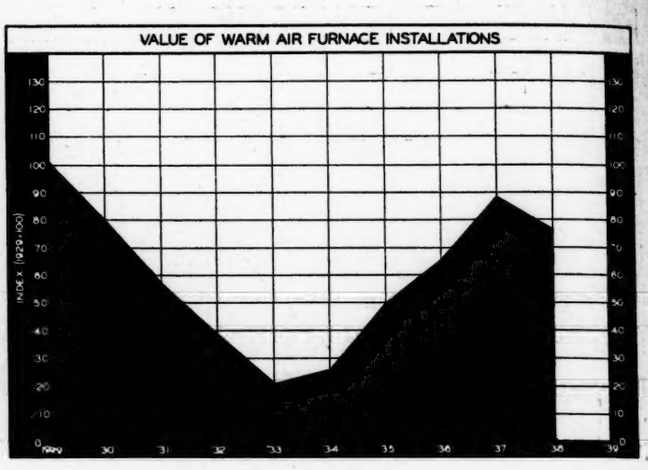


12 **How the sale of heating equipment (not including summer air conditioning) is divided between new buildings and existing buildings. This curve is based on construction census data, new building figures, the Index of Heating Business Activity, and the heating equipment price index.**

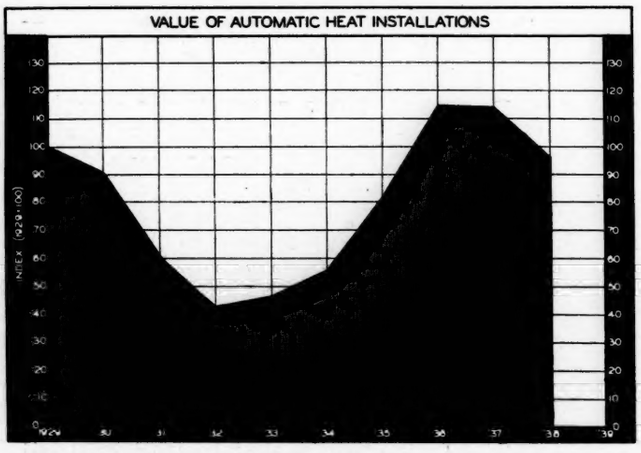
VALUE OF BUSINESS



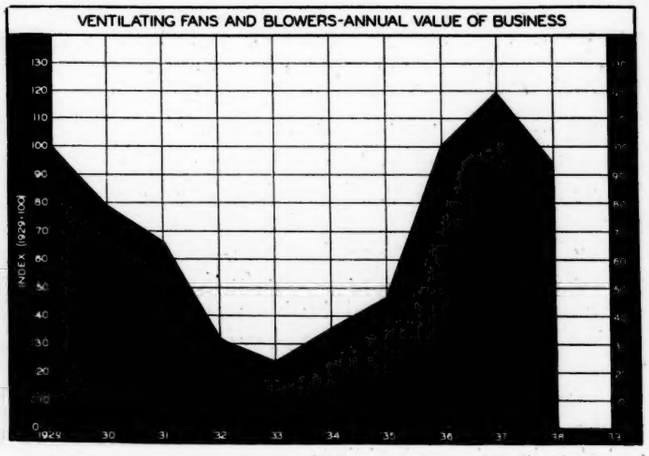
13 An estimate of the total value of the boiler business. This includes oil, gas, steel, and round and sectional cast iron boilers. The value is based on cost of boiler installed but without connections.



14 An estimate of the total value of the warm air furnace business. Oil and gas furnaces, as well as coal-fired steel and cast iron units, are included. The figures include the installed cost exclusive of connections.

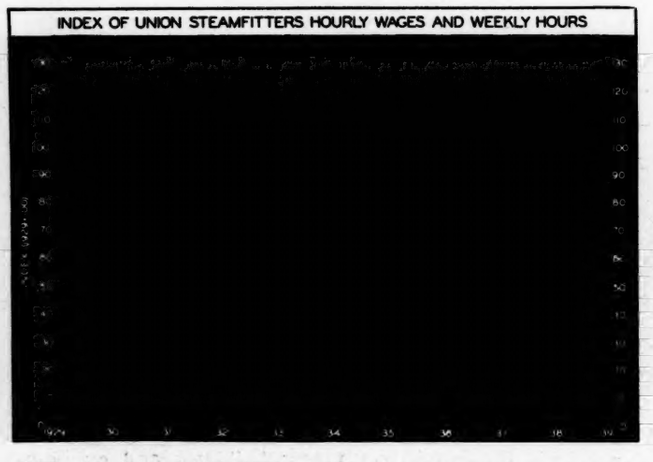


15 An estimate of the total value of the automatic heating business. Included is the installed cost of oil burners, heating stokers, and central gas-fired equipment. The values do not include heating system cost.

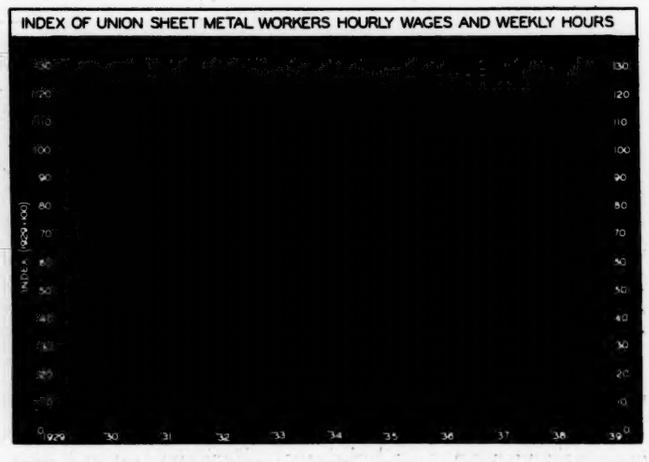


16 Index of the value of the fan and blower business, with 1929 = 100. Includes large and small blowers, propeller fans and motors. 1929 and 1930 estimated. Later figures from manufacturers' reports.

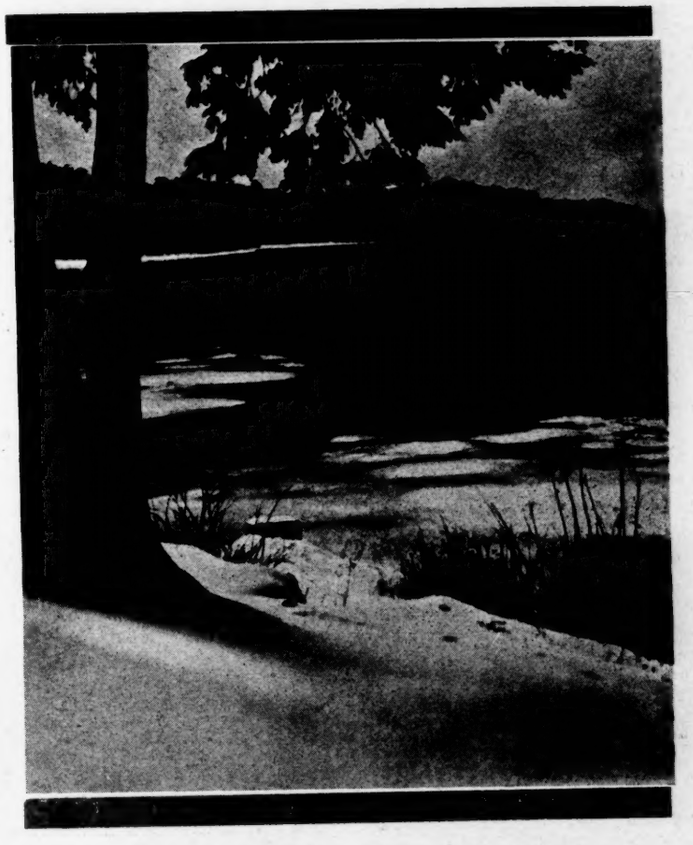
WAGE RATES



17 Indexes, with 1929 = 100, of union wages and weekly hours of union fitters. The figures are from a survey by the U. S. Department of Labor.



18 Index, with 1929 = 100, of the union wages and weekly hours of union sheet-metal workers. The figures are from a survey by the U. S. Department of Labor.



WINTER SECTION

Pages 28 to 65

BADGER EXPANSION JOINTS

FUNDAMENTALS

that make them Preferred and Purchased by leading companies

Just what are the fundamentals in connection with expansion joints? Here are a few that you should consider carefully when in the market:

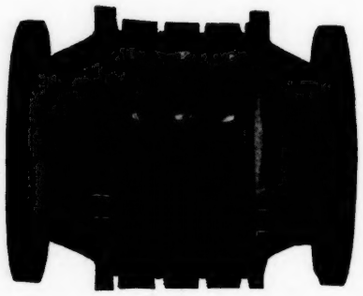
Suitability for Wide Range of Service—There is nothing more natural in its action than the Badger corrugated type of expansion joint when absorbing pipe line expansions and contractions. Standard joints of the corrugated type are suitable for pressures up to 300 pounds; for temperatures up to 900°F.; and for corrosive as well as non-corrosive conditions. Single units for traverses up to 6 inches; double up to 12 inches.

Elimination of Maintenance—The Badger corrugated type expansion joint does not use packing. It requires no maintenance, a particularly useful feature when lines are installed underground or in cramped quarters.

Manufacturing Experience Back of Joints—With more than forty-five years experience in the manufacture of the corrugated type of expansion joint, it is to be expected that Badger makes its joints in the most skillful way with modern machinery and gets fullest value from controlled heat-treating.

When you buy Badger Expansion Joints you are buying joints that are fundamentally sound!

Our latest bulletin (No. 100) gives full details as to application, sizes and list prices.



E. B. BADGER & SONS CO.

75 PITTS STREET BOSTON, MASS.

Agents in Principal Cities

Competition in House-Heating and Activity in Minimum Standards Emphasized in '38

Winter

IN a year which was notable for its feeling of uncertainty there are several points of such interest both for what took place and for what they may represent in trends that attention is directed to them. They are: (1) the competition between direct-fired warm air and steam and hot water for the residential market; (2) the government activity in research and setting minimum standards; and (3) the struggle over fuels for heating.

The particular (and at one time just about the only) field for warm air heating was for a long period the small detached residence. Multiple housing structures larger than the two-family, and occasionally the four-family, were conceded to steam and hot water systems. Even in the detached residence field only the smaller ones used warm air while many of the larger ones used either steam or hot water. Then with the advent of the fan and filter, it was seen that the warm air method could be readily adapted to larger houses, until even the largest and most pretentious was not beyond the aspirations of warm air advocates. When the possibility of summer air cooling in residences began to be seriously considered the use of circulating air methods throughout the year received a substantial boost. The net result was more attention, more publicity, more sales effort, and more installations. Warm air for detached residences became quite the thing, to a point that in the past few years it has moved rapidly in acceptance. There are no reliable statistics to show the absolute or relative rates of growth of this warm air business but in some cities it is emphatically stated that in 90% and over of all new residences which use any form of central heating the choice falls to warm air. In other cities the percentage is greatly smaller. By and large, however, a large part of the total do use warm air furnaces either forced or gravity, and by and large the increase in the trend in 1938 was substantial.

At the same time methods and equipment for using direct fired warm air circulation in multiple-family structures were receiving close attention. Equipment was developed which was compact and suitable for closet installation so that each apartment or suite might have its own central system within the apartment building. More or less experimental installations were made several years ago but during 1938 some large and prominent ones were installed. Additional equipment, not yet announced, but similar to that now in use, is at present undergoing development. So also is equipment known to be in the experimental stages which makes use of methods substantially unlike those in use. In other words, multiple-family structure heating is just at the outset of a course of change such as has characterized practice in single, detached residence building. Whether these changes will result in warm air methods winning any large amount of this market is still in the future. What took place in 1938 was merely enough to indicate a possible tendency.

Final results in the warm air versus steam or hot water struggle for the housing market are tied around success in both detached residences and multiple structures. If either method can win a decisive victory in both fields the resulting volume is likely to be so great as to cripple the other from a competitive standpoint. If the contest brings merely a small shifting of the total available business, then things can be expected to continue much as at present with both methods getting a share which varies up or down from year to year.

No one who wishes to keep his bearings and who wants to follow developments with an open mind rather than becoming an outright advocate of some one method of heating should conclude, from the recent gains made by warm air in the detached residence field, that the struggle is over or that the end is in sight. As a matter of fact neither side has by any means exhausted all its resources for from an engineering standpoint alone there is still much to be done. Neither should it be forgotten that this competition is affected very greatly by a rather small price differential between the various methods, and relatively small shifts in costs of equipment or labor may easily change the whole complexion of the situation most surprisingly.

Fuel Competition

During the year sales of automatic heating equipment were reported off from 1937, but not uniformly so for stokers continued to show to advantage saleswise. Gas interests took an increased hold on their sales efforts while domestic oil-burning equipment makers and handlers generally were in confusion. They were faced with a reversal of the factors which had helped them dominate the automatic fuel market for years. No longer were they able to command a specialty device as in the early days and no longer could they convincingly urge the supremacy of oil as *the* automatic fuel since stokers and gas equipment were either fully or substantially automatic also. Moreover, these newcomers had largely straightened out their technical, distribution, and sales problems to the point where they were aggressively challenging the oil men on every front. What is still more to the point, both coal and gas equipment sales efforts had the active sup-

port of the fuel supply interests to a more effective degree than did the oil equipment men. The net result was a jittery year for oil and one below expectations, but nevertheless encouraging for the others.

The year also saw more evidence that in the competition for that fraction of the market represented by really small houses, there is still much to be done. It is the segment which has received least attention from equipment designers up to now but is being scanned closely. While nothing of a particularly striking nature has yet come forth, it is believed that all the ferment will produce real results shortly.

At the other end of the scale in the large building market for fuel equipment there was an almost complete absence of signs or portents which would lead to the conclusion that fuel practices are in for substantial changes.

Government Activities

Two moves by government agencies during the year bid fair to be of such possible significance that they must be mentioned.

One is the proposal of FHA that standards of performance of heating equipment be used by it in connection with its loan insurance function. As definite performance standards are not in existence for some important groups of equipment, the proposal entails much effort in drawing up suitable standards and in testing equipment to determine its performance. As the year closed, the proposal was alive and work under it was progressing but had not reached a stage where its effects were important. It is of especial interest, however, to the whole industry because it marks the first move of a government agency to set up acceptance requirements, because of the dominant position of FHA in loan insurance, and because of the important effects possible if the plan ever got into full operation.

The other government activity is that represented by the several programs set up to furnish information to all the government groups interested in low-cost housing. It is proposed that this program include laboratory studies and tests where necessary and that heating equipment be made a part of the projects. This general program started functioning during the year and results of early studies were published. To what extent all findings and recommendations will be publicized is not determined, but this program's importance to the industry generally lies in the possibilities of what may result from it in the future.

Boilers and Furnaces

There were but few announcements of new designs or models of steam or hot water heating boilers during the year. In no recent year have there been so few. Most of those announced were to meet special requirements such as the accommodation of oil burners or were small models for use in low-cost residences. It is thought that no particular significance attaches to this shortage of new boiler announcements.

A considerable number of new designs of warm air furnaces appeared. Many of these were for use with gas as the fuel and generally were of small capacity with some showing capacity ratings of as low as 50,000 B.t.u. per hr. It is notable that several manufacturers who have previously offered no furnaces—only boilers—this year entered the furnace business. It is also important to note that generally there is a tendency to break away from established practice in these new furnaces and to aim at greater compactness. This has brought about some ingenious heating surface arrangements and some gains in reduced floor space and height of furnace. One strange result is that there are now so many warm-air furnace designs using small hourly amounts of gas, and which would have to be applied to the smallest residence plants.

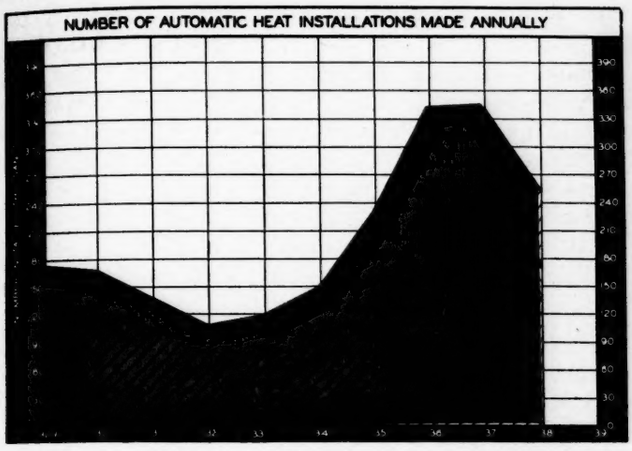
During the year a boiler appeared on the market with a chrome steel combustion chamber in a wet bottom boiler designed for oil burning. The metal chamber surrounds the flame and takes the place of the refractory lining which has been in use for such purposes. It is stated that the metal lining comes up to final temperature in only a minute and cools off quickly after the burner cuts off. The result is said to be much more even heating, the saving of considerable shipping weight, and of much field labor. To what extent this arrangement may become general in such boilers cannot be determined but is sure to be followed closely.

Coal Stokers and Coal Equipment

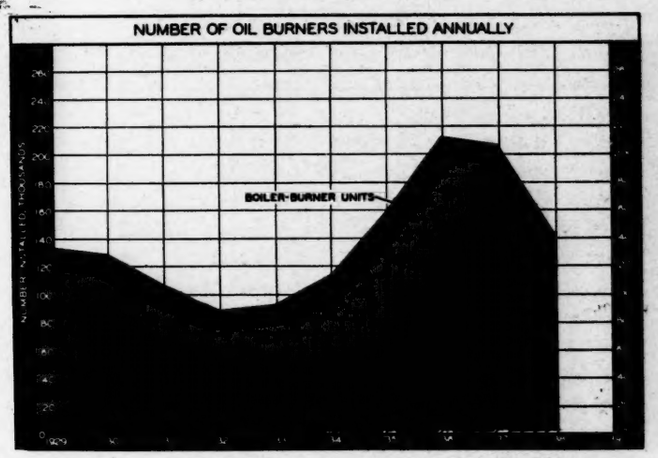
Probably it was only natural that new designs and new models of automatic unit stokers for heating purposes continued to appear throughout the year. These stokers are gaining rapidly in acceptance and their spectacular increases in sales in the past two years have helped to keep the interest of product designers focussed on them. Knowledge of the stoker technique and of the mechanical and combustion characteristics of coal for stokers is increasing fast. The manufacturing and marketing opportunities look attractive. Much of the design and development talent which was previously concentrated on oil or gas burning equipment is now being applied on stokers and on coal-burning equipment generally.

Technically, the picture is reasonably clear so far as the principal features of the automatic stoker are concerned. The underfeed principle seems too well established to be quickly supplanted. Bin feed instead of hopper feed is definitely on the way, especially in new construction when planning permits correct location of bin and feeder. Coordination of air supply with fuel demand is being developed rapidly. Automatic control is just about universal. The present stoker is also almost wholly a conversion device and while it is probably inevitable that eventually it will be a designed-in feature, still there is little to indicate now that this stage is to be expected soon. The tendency to put a stoker into smaller and smaller buildings continues and many of the year's new products were intended to reach into the small fuel demand class with a feed rate of 20 to 50 lb. per hr. Notable was one stoker design making use of a spreader method of feed and intended to handle ¾-in. to 1¼-in. screenings.

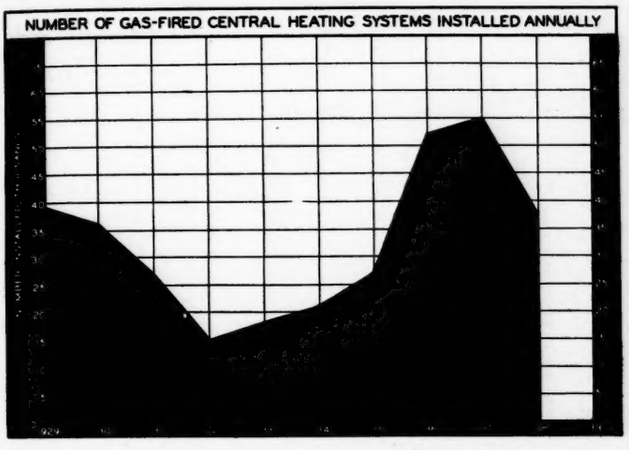
Also indicative of the growing attention to coal was the large number of technical and trade conferences held at educational institutions throughout the year. While there have been a number of these devoted to promoting education on utilization of bituminous, the



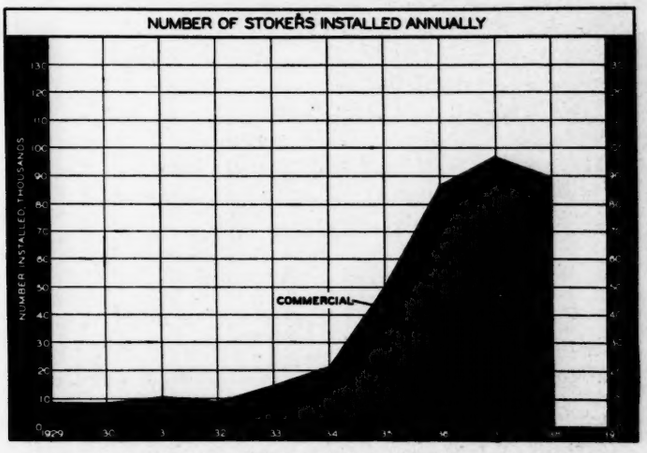
19 An estimate of the number of automatic heating installations made annually since 1929, including oil burners, central gas systems, and stokers.



20 The trend of oil burner installations during recent years. The conversion burner figures do not include industrial type burners. Figures do not include exports.



21 An estimate of the number of gas heating units installed by years. Space heaters are not included, since the chart covers only central systems.



22 An estimate of the number of stokers installed annually. Industrial type stokers used for power generation are not included.

year saw the inauguration of the first of like kind devoted to anthracite. All the factors tending toward a struggle between the rival coal groups are present but up to now the efforts of each group have been more directed toward capitalizing on the stoker as a means of getting lost business rather than of engaging in a fight between themselves.

Gas Burning Equipment

New equipment announced for use with gas as a fuel consisted of several unit heaters of the propeller fan type for both commercial and industrial applications. It is noteworthy that conversion burners for gas were not included in the new equipment of the year. So also were there but few new designs of gas-burning boilers. On the other hand several new gas-burning warm air furnaces put in an appearance. These new furnaces generally were equipped with fan and filter and were carefully designed to conserve space. The result is that the new furnaces are compact and are well treated for eye appeal. It is also notable that the gas-designed furnace is a favorite with the merchandising type of manufacturer who offers it along with similar ones for use with oil or stoker. These furnaces are also being designed with an eye toward their possible use in multiple-family construction and some apartment house installations have used gas equipment of this kind. (See HEATING & VENTILATING, February, 1938, page 17.)

It is to be noted that the use of gas equipment for heating purposes is receiving support from the American Gas Association. A new handbook intended for salesmen of gas heating equipment was prepared by the Association and published in May under the title "Comfort Heating." The Association also acts as a clearing house of information constantly.

Aggressive selling and merchandising campaigns to secure gas loads from heating were also carried out by many gas utility companies during the year. In the natural gas territories especially those efforts are so effective that a considerable part of the new construction and some modernized installations made use of gas.

Oil Burners

So far as oil burning devices are concerned the situation is greatly confused. Methods of getting oil atomized or vaporized and ready to burn are now so well understood that little is to be expected in the way of new developments in method. Refinement of method and equipment, simplification of construction, reliabil-

WINTER EQUIPMENT SALES STATISTICS

1 Cast Iron Square Boilers
Shipments, Thousand Pounds

	1935	1936	1937	1938
Jan	10,604	13,786	13,616	10,852
Feb	9,275	11,955	11,306	8,417
Mar	6,964	8,984	13,947	9,209
Apr	7,730	11,129	14,345	10,557
May	9,241	13,552	12,710	12,798
Jun	10,700	19,523	15,252	14,123
Jul	16,332	29,200	17,471	17,841
Aug	21,689	24,658	25,149	17,804
Sep	31,761	33,549	40,915	30,852
Oct	41,380	45,960	39,539	34,108
Nov	20,325	28,642	20,459	—
Dec	16,330	19,765	16,036	—
YEAR	202,331	260,703	240,745	—

2 Cast Iron Round Boilers
Shipments, Thousand Pounds

	1935	1936	1937	1938
Jan	2,666	3,120	2,244	1,422
Feb	2,494	2,437	1,897	1,215
Mar	2,102	1,664	2,131	1,131
Apr	2,115	1,683	1,808	1,181
May	2,493	2,243	1,622	1,297
Jun	2,710	3,193	2,130	1,400
Jul	3,647	3,905	2,325	2,015
Aug	4,368	3,634	3,386	2,287
Sep	6,879	5,809	5,807	4,078
Oct	9,485	8,633	5,898	4,803
Nov	4,957	5,202	2,916	—
Dec	4,018	3,562	2,158	—
YEAR	47,934	45,085	34,322	—

3 Steel Heating Boilers
New Orders, No. of Units

	1935	1936	1937	1938
Jan	190	444	422	336
Feb	163	453	437	278
Mar	191	347	843	364
Apr	296	373	439	391
May	803	416	441	446
Jun	323	639	535	641
Jul	355	758	856	643
Aug	535	783	1,075	797
Sep	617	913	760	904
Oct	534	844	616	849
Nov	377	539	375	—
Dec	369	434	372	—
YEAR	4,753	6,943	7,171	—

4 Steel Heating Boilers
New Orders, Sq. Ft. Heat. Surf.

	1935	1936	1937	1938
Jan	63,385	214,719	180,160	135,023
Feb	55,611	209,172	204,830	127,095
Mar	75,171	156,130	400,179	139,913
Apr	106,485	162,279	184,420	171,831
May	356,648	182,593	188,079	206,305
Jun	146,547	312,718	200,795	220,043
Jul	146,931	343,698	346,471	227,884
Aug	221,525	313,895	427,076	254,244
Sep	216,720	302,925	249,299	288,120
Oct	191,442	285,138	202,411	273,368
Nov	107,140	187,695	122,452	—
Dec	183,076	157,883	152,785	—
YR	1,870,681	2,828,845	2,858,957	—

5 Mechanical Draft Oil Burners
Shipments in U.S., No. of Units

	1935	1936	1937	1938
Jan	3,089	5,511	6,600	4,546
Feb	3,145	5,515	6,870	3,888
Mar	4,130	6,883	11,021	6,037
Apr	6,589	7,788	11,467	5,324
May	7,507	9,850	10,833	6,419
Jun	7,783	11,387	10,876	7,055
Jul	7,608	14,138	12,456	8,167
Aug	12,493	17,347	17,747	11,874
Sep	23,175	29,770	28,142	21,500
Oct	21,209	28,236	19,817	16,690
Nov	7,465	12,756	7,804	—
Dec	5,613	8,232	6,023	—
YEAR	109,806	157,413	149,656	—

6 Natural Draft Oil Burners
Shipments in U.S., No. of Units

	1935	1936	1937	1938
Jan	72	96	74	30
Feb	69	39	49	25
Mar	34	32	56	24
Apr	39	24	74	23
May	60	32	53	34
Jun	20	52	18	30
Jul	44	54	29	35
Aug	82	95	45	64
Sep	212	143	108	73
Oct	268	189	150	95
Nov	133	160	88	—
Dec	82	77	47	—
YEAR	1,115	993	791	—

7 Boiler-Oil Burner Units
Shipments in U.S., No. of Units

	1935	1936	1937	1938
Jan	272	411	599	319
Feb	231	361	675	314
Mar	361	515	757	403
Apr	613	592	857	487
May	974	780	1,177	676
Jun	837	1,416	1,037	758
Jul	744	1,237	1,227	759
Aug	1,143	1,557	1,384	1,227
Sep	1,559	2,332	2,120	2,042
Oct	1,816	2,298	1,874	1,699
Nov	804	1,034	723	—
Dec	450	706	400	—
YEAR	9,804	13,239	12,830	—

8 Furnace-Oil Burner Units
Shipments in U.S., No. of Units

	1935	1936	1937	1938
Jan	45	221	463	313
Feb	40	230	523	271
Mar	53	223	755	340
Apr	96	344	660	468
May	135	286	782	471
Jun	137	545	874	651
Jul	197	560	936	759
Aug	333	776	1,316	949
Sep	594	1,050	1,430	1,402
Oct	706	1,130	1,315	1,225
Nov	399	846	669	—
Dec	277	619	433	—
YEAR	3,012	6,830	10,156	—

9 Total Oil Burner Sales
Total of Tables 5-8, Incl.

	1935	1936	1937	1938
Jan	3,478	6,239	7,730	5,208
Feb	3,485	6,145	8,117	4,498
Mar	4,578	7,653	12,589	6,804
Apr	7,337	8,748	13,058	6,302
May	8,676	10,948	12,845	7,600
Jun	8,777	13,400	12,805	8,494
Jul	8,593	15,989	14,648	9,720
Aug	14,051	19,775	20,492	14,114
Sep	25,540	33,295	31,800	25,017
Oct	23,999	31,853	23,176	19,709
Nov	8,801	14,796	9,284	—
Dec	6,422	9,634	6,903	—
YEAR	123,737	178,475	173,433	—

10 Residential Stokers
Sales, No. of Units

	1935	1936	1937	1938
Jan	1,241	2,114	2,494	1,955
Feb	1,113	2,442	2,685	2,103
Mar	956	2,473	4,912	3,393
Apr	1,046	3,006	5,347	3,131
May	1,706	3,589	6,096	4,437
Jun	2,432	4,342	7,813	5,365
Jul	2,872	5,488	6,452	8,075
Aug	4,931	8,433	11,590	11,380
Sep	8,687	15,061	16,608	18,330
Oct	8,777	16,584	14,492	15,728
Nov	4,287	7,857	5,292	—
Dec	3,078	4,897	3,670	—
YEAR	41,126	76,286	87,451	—

11 Small Commercial Stokers
Sales, No. of Units

	1935	1936	1937	1938
Jan	147	189	198	203
Feb	107	167	199	169
Mar	84	138	236	237
Apr	83	130	307	215
May	107	124	279	195
Jun	158	202	380	271
Jul	190	316	405	379
Aug	348	492	760	602
Sep	615	808	1,228	950
Oct	683	1,022	1,181	890
Nov	359	529	514	—
Dec	281	431	381	—
YEAR	3,162	4,548	6,068	—

12 Large Commercial Stokers
Sales, No. of Units

	1935	1936	1937	1938
Jan	61	84	185	161
Feb	48	71	228	116
Mar	37	41	167	146
Apr	33	44	202	133
May	41	60	205	199
Jun	55	78	289	258
Jul	96	148	392	371
Aug	164	198	657	573
Sep	272	270	933	846
Oct	268	303	920	721
Nov	145	301	473	—
Dec	108	185	351	—
YEAR	1,328	1,783	5,002	—

ity in operation, safety, and reduction of servicing are the directions now being taken in oil burner development. Factory production in volume, economical distribution and reduced consumer prices are factors of importance.

One technical announcement of interest and importance took place during the year when an oil burner manufacturer brought out a design which permits adjustment of the oil-burning rate over a wider range than ever before considered practicable, and which permits this adjustment to be made under automatic control if desired.

Other new burner announcements consisted largely of low-price products brought forth for competitive reasons, of burners brought out by stoker manufacturers, of those put on the market by "merchandisers" of various kinds and seldom actually manufactured by them although carrying their trade names. The persistence of locally-assembled burners offered on the market at low prices continued to disturb the situation. So also did the absence of any accrediting method tending to put a floor under burner performances.

Quite apart from the matter of burner design, burner applications, and similar points of technical interest are those of interest because of their commercial importance and because of the way they affect future events.

One of these is the matter of prices and costs of competitive fuels and equipment. For a long time oil was alone in offering automatic advantages. Those were the days when oil burner equipment makers and their organizations rode high. Now stokers for both anthracite and bituminous have come along and natural gas lines have spread further and further. Their competition is now effective and felt. Automatic burners for gas and substantially automatic burners for coal are being offered in the market at prices at least as attractive to the consumer as anything which the oil people can offer. Fuel costs are less for gas or coal in many localities than are the costs of oil. This situation offers a puzzle for those trying to push oil in such places.

As the year closes there is no gainsaying the fact that things are very much in a fog so far as the whole fuel-for-heating picture is concerned. There is little doubt but that oil is now at a competitive disadvantage generally. Coal bids fair to continue its comeback, probably at an accelerated rate.

Heating Surfaces

In no recent year have fewer new heating surface products been offered. No doubt this results from the rapid and notable developments which have followed one another for the past six or eight years. These products can now be expected to pass through a period of design stability.

Unit heaters continued in their trend toward small sizes, toward improved external appearance, and toward refinements generally rather than any departure in the essentials of either design or application. Heaters especially designed for use with hot or cold water continued to appear largely as a result of year-round service demands.

Blast or central coils likewise went through the year without fundamental changes. A new controlable, nonfreeze and non-stratifying cooling coil came on the market in the latter part of the year. A redesign of the internal steam distributing device of one of the central coil heaters is reported.

As the field of application of gravity convectors has broadened new lines appeared, notably one intended especially for institutional work where the demands are so peculiar that special construction was necessary heretofore. The surfaces themselves and the general methods of application underwent no marked changes. Several new fan-powered convectors, which may be considered a special form of unit heater, were offered. These were generally for location in the room, were enclosed in carefully finished metal coverings and frequently are intended for use with either cold or hot water. They may be considered as a bid for accommodating the anticipated combination heating and cooling installations using water as the heat circulator.

No new cast iron tubular radiators or new cast iron gravity convectors put in an appearance. This is the second consecutive year without substantial changes being announced in this general class of devices.

District Heating

District heating as practiced by the public utility companies presented no notable changes. A moderate amount of line extension was reported from several cities but activities were mainly confined to routine operating and service. Studies looking toward the extended use of utility steam for summer cooling are in progress and improvements in the equipment used for the purpose are thought to be such that steam for cooling can find wider usefulness. Activities of the NDHA included preparation of material for use by consumers and proposals for publicity. Group heating in industry and institutions included large apartment house projects, several important college and university extensions, new plants for several army and navy posts and for institutions.

Steam Heating in 1938

If definite trends were discernible in connection with steam heating during the year one of them would appear to be the continued invasion of alternative means in the residential and small building field. Air conditioning was perhaps less prominent than a year ago. Hot water, however, was more definitely in the picture, not only in the smaller buildings but even making an occasional excursion into a larger building of the type that was formerly exclusive with steam. And more than one manufacturer in the steam appliance field added one or more hot water systems or appliances to his line. It is too early to say whether this trend will become general or whether further technical development may throw the balance of both performance and cost in favor of low pressure steam.

The "third phase" of low cost housing, the USHA program, got under way in 1938 with low-pressure steam circulation as the favorite. Comparison of the plans now coming on the market with those of the preceding program show definite progress toward simplicity and generally low cost. Gone are the high-pressure boiler plants and in their place are group boiler plants with two or three boilers in each battery generating steam at 10 lb. or less. The only pressure reduction

between the boiler and the heating system is taken directly through the central heating control valve.

Piping costs have been reduced by the simple expedient of placing radiators near risers and not attempting to spot every radiator under a window. A similar objective is aided by making both supply and return connections to the same side of a radiator. Control is continued for its primary purpose as a heat economizer but specification provisions for close temperature control are largely eliminated.

Some prominent engineers maintain that these latest low-pressure vacuum systems in housing jobs actually involve less first cost than would be the case if uncontrolled one-pipe systems were installed while their greater operating economy is not open to argument.

With steamfitting trades at a "stabilized" rate of $2 per hr. in New York, for example, intensive studies are being made to reduce installation cost. Some of these are most interesting but unfortunately none of them reached the marketing stage during 1938.

One new system development was not only recorded but given rather wide publicity due to the public attention gained by the architecture of Frank Lloyd Wright. Mr. Wright talked of "steam piping buried in the concrete floors" at some length. Whether it works, and how well it works the editors have been as yet unable to learn.

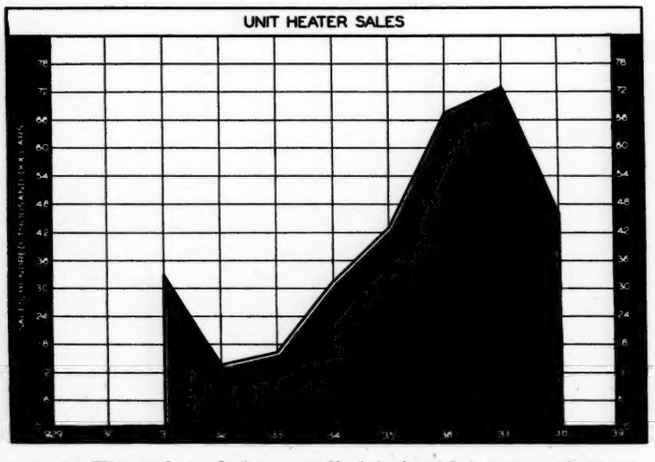
There was startlingly little in the way of new appliance development during the year, outside of an increase in the number of adjustable orifice valves and a few additional forms of high vacuum circulation.

An exception was the appearance of a system illustrated later in this section wherein the products of combustion from a gas burner are mixed with water vapor and then passed through the radiators. The steam condenses and flows back to the boiler while the flue gases are exhausted through a stack to the outside. A special exhaust fan maintains a slight vacuum on the radiators so there is a positive draft on the gas burner at all times. It is said that this system operates with efficiencies of 90 to 95% in field use.

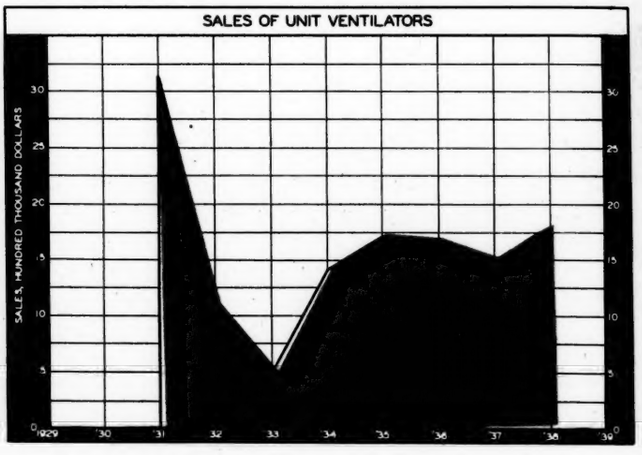
Hot Water Heating

Forced hot water heating continued to receive the measure of attention which it has enjoyed for the past several years. Positive circulation seems to have taken away much of the disfavor with which hot water was looked at for so long a time. Better information on

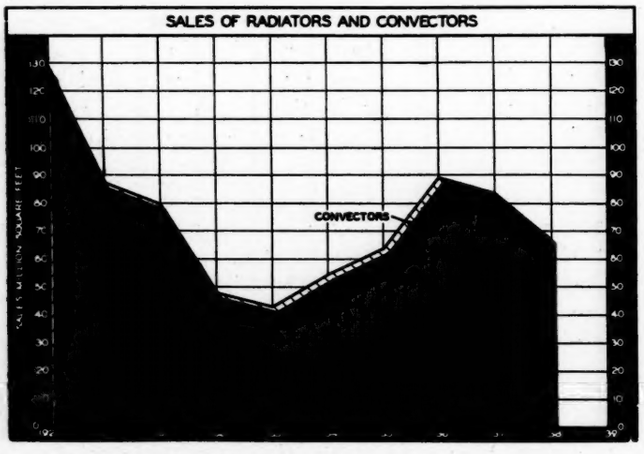
ANNUAL SALES



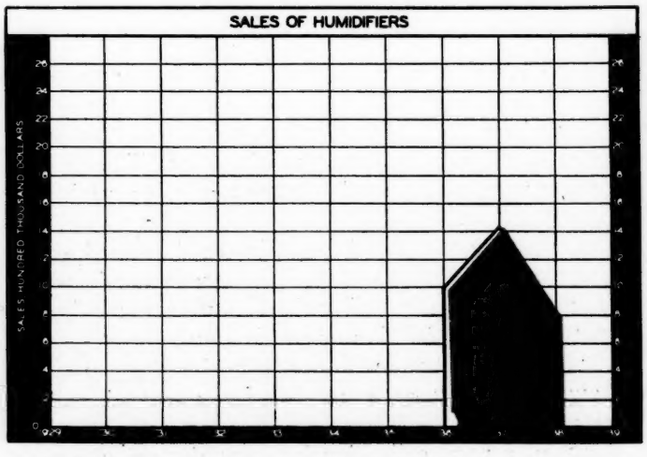
23 The sales of the so-called industrial type unit heaters which are also widely used in commercial buildings as well as in factories.



24 Sales of unit ventilators primarily used for heating and ventilating school buildings. The sales are in terms of new orders and do not represent installed cost.



25 Sales in equivalent square feet of convectors and direct cast iron radiators. The convector figures include cast iron convectors as well as non-ferrous types.



26 Sales of humidifiers as reported by a number of manufacturers. Figures are in terms of new orders. Statistics for years prior to 1936 are not available.

design and active promotional efforts of several equipment makers are also responsible for some of the renewed interest in this form of heating. The control refinements possible with hot water, and especially the control of inside temperature from a sensitive bulb located outside, are also being better appreciated as time goes on. General acceptance of the propriety of sizing radiators on the assumption of mean surface temperatures of over 200F is also advancing with consequent reduction of cost.

No further developments were published during the year in the matter of new designs of hot water systems based on making use of the storage of service hot water as the principal feature with building heating as an auxiliary. The general considerations of such an installation were outlined in the January, 1938, issue of HEATING & VENTILATING.

An interesting departure of the year is illustrated later in this section wherein a hot water unit heater with a propeller type fan is attached to the service hot water storage tank outlet and can thus extract heat from the fuel used for supplying service hot water. It can be seen that this has interesting possibilities but no reports of operating results are at hand on which to base conclusions.

Still another announcement during the year, and also illustrated later in this section, was of a method of circulating hot water through the system steadily while bypassing the boiler with a large or small fraction of the circulating water depending on the severity of the load demands. This system incorporates control from outside as an integral feature. Operating results from this system also have not yet made their appearance.

One of the year's developments of interest was the increased attention paid to zoning of hot water heating installations. Use of smaller pipe and smaller radiators than were common practice on gravity systems permits zoning by using pumps and motorized valves without increasing the total cost appreciably over that necessary with gravity installations. Zoning was used on many of the larger installations made in 1938. Modernization by changing old gravity circulation jobs over to forced circulation also amounted for a considerable fraction of the year's activity.

Warm Air Heating for Residences

While there seems little doubt that warm air heating was the most popular form used in residence construction during the year, no outstanding changes in technique or equipment were forthcoming. To an even greater extent than in the past few years furnace designs were stable. The essential proportion of ducts, outlet sizes and location, and such matters as air quantities and velocities have been so far standardized as to permit codification and the coded rules seem to be gaining in acceptance among installers. Moreover, there is little on the horizon to indicate any coming shifts or any trend departures in the immediate future.

The hot water supply problem continues to be a most troublesome one where warm air heating is used in residences. Fuelbox coils, water-jacketed sections in the furnace or separately fired heaters for hot water continue as the only available methods. Once the warm air furnace goes out of use in the summer months, the choice of method is frequently confined to a separately fired water heater only. Although the problem is known to be receiving active study by many equipment builders, no announcements of especial importance were made during the year.

Automatically-fired furnaces of 50,000 to 70,000 B.t.u. capacity at really low prices are considered desirable for the truly low cost residence. Stoves or gravity parlor heaters are now used in many such new residences to the exclusion of central-fired forced-air furnaces. Many makers of furnaces consider this an excellent possible field for endeavor and the search for suitable devices to meet the requirements goes ahead steadily. Several gas-fired, forced-air furnaces of this capacity range appeared during the year.

Use of change in fan speed as a means of temperature control is a subject about which there has been much difference of opinion in warm air furnace practice. It now seems to be well established that some variation of fan speed rather than pure start-and-stop operation is desirable for comfort. This bids fair to become a trend, for at least two-speed fan operation is now provided for in many furnace designs and the year saw this tendency intensified. How far fan speed regulation can be carried with economy in both first cost and operating results is still being debated.

As has been the case for many years the research at the University of Illinois under the auspices of the National Warm Air Heating and Air Conditioning Association continued to supply technical findings on the subject. Results of tests made in the research residence when an underfeed coal stoker was used, were reported at the Milwaukee meeting of the Association in June (results summarized in HEATING & VENTILATING, July, 1938, page 61). As a direct outgrowth of this long research project Prof. S. Konzo has been delegated by the Association to prepare a text and reference book on forced air heating.

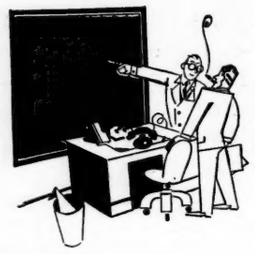
Near the close of the year a definite move was made by the furnace and accessory manufacturers to launch a joint publicity campaign to forward their interests. A separate organization was formed for the purpose and headquarters were established in New York.

Statistical Position

The dissatisfying showing in sales of winter heating and air conditioning equipment during 1938 as compared with 1937 has only one redeeming feature, and that is that the closing few months will probably bolster up sales to a fairly respectable degree. Comparisons on these pages are necessarily limited to the record for the first ten months of 1938 and the corresponding period of 1937; as we go to press, however, the outlook is extremely favorable, with every indication that November and December figures will reflect the improved position to such an extent that some equipment sales may break almost even with 1937 sales. Be sure to bear in mind, then, that the following comments are based on ten months' figures.

For a long period the price situation in unit ventilators has been, to say the least, weak; consequently, the 21% gain in '38 dollar sales of this equipment is encouraging. These devices, used almost exclusively for school work, were one of the few heating equip-

WINTER EQUIPMENT SALES STATISTICS



13 Humidifiers
Orders, Dollars

	1935	1936	1937	1938
Jan	—	83,192	165,558	76,584
Feb	—	79,401	160,734	73,166
Mar	—	43,401	170,689	57,708
Apr	—	57,016	160,274	59,316
May	—	65,395	166,136	62,404
Jun	—	82,323	163,162	72,127
Jul	—	101,552	69,623	80,094
Aug	—	73,921	96,060	74,821
Sep	—	83,506	100,689	79,491
Oct	—	125,087	65,005	81,665
Nov	—	87,045	61,796	—
Dec	—	107,240	56,629	—
YEAR	—	989,079	1,436,355	—

14 Unit Heaters
Orders, Dollars

	1935	1936	1937	1938
Jan	284,005	402,091	494,053	412,164
Feb	211,057	367,197	372,864	281,303
Mar	180,592	263,040	496,799	288,555
Apr	185,869	210,881	429,078	192,505
May	218,398	232,695	439,431	195,887
Jun	192,731	298,643	611,053	257,852
Jul	226,085	480,989	376,925	253,572
Aug	299,586	569,605	573,152	398,709
Sep	510,983	773,205	895,580	598,441
Oct	835,571	1,359,652	1,131,419	795,367
Nov	577,003	990,487	773,453	—
Dec	591,612	815,148	702,234	—
YR	4,310,492	6,763,633	7,296,079	—

15 Unit Ventilators
Orders, Dollars

	1935	1936	1937	1938
Jan	158,417	202,503	122,057	135,261
Feb	67,521	216,401	119,719	219,565
Mar	109,051	130,570	197,210	189,858
Apr	138,362	190,302	77,465	176,086
May	118,440	196,048	78,492	118,099
Jun	187,129	168,572	89,388	109,935
Jul	112,356	123,926	212,752	67,812
Aug	132,012	133,389	170,969	64,426
Sep	99,415	62,645	64,523	104,723
Oct	69,357	96,381	87,953	290,571
Nov	101,904	62,077	110,549	—
Dec	441,336	92,299	143,747	—
YR	1,735,300	1,675,113	1,474,824	—

16 Cast Iron Radiators
Shipments, 1000 Sq. Ft.

	1935	1936	1937	1938
Jan	3,117	4,183	4,572	3,320
Feb	2,787	3,086	3,613	2,571
Mar	2,023	2,720	4,343	2,715
Apr	2,366	3,549	4,624	3,692
May	2,835	4,175	4,416	5,008
Jun	3,462	5,590	5,360	4,423
Jul	4,675	8,027	5,543	5,219
Aug	6,470	7,785	7,178	5,214
Sep	7,701	9,190	9,122	6,387
Oct	10,055	12,452	9,550	7,679
Nov	6,616	9,475	6,671	—
Dec	5,413	7,444	5,119	—
YEAR	57,520	77,676	70,111	—

17 Non-Ferrous Convectors
Elements Only, Sq. Ft.

	1935	1936	1937	1938
Jan	80,595	145,028	34,360	21,707
Feb	45,529	61,682	21,669	18,298
Mar	48,013	62,856	18,398	25,080
Apr	46,182	51,085	41,161	25,904
May	49,424	74,301	83,867	51,520
Jun	56,280	84,395	40,803	45,847
Jul	81,619	100,984	41,192	71,532
Aug	73,768	139,583	89,992	60,010
Sep	58,713	105,887	90,073	64,678
Oct	114,171	141,406	63,977	57,963
Nov	112,915	102,927	57,554	—
Dec	60,118	168,264	35,003	—
YEAR	824,327	1,238,398	618,049	—

18 Non-Ferrous Convectors
Elements Only, Dollars

	1935	1936	1937	1938
Jan	8,321	12,794	5,804	3,817
Feb	5,735	8,270	3,651	3,148
Mar	5,707	9,089	2,835	4,247
Apr	8,238	9,516	5,949	4,318
May	7,549	17,440	12,469	7,822
Jun	10,854	13,713	6,368	8,124
Jul	13,315	16,757	7,190	10,832
Aug	11,581	24,219	16,244	9,194
Sep	8,087	19,408	15,178	10,347
Oct	13,146	25,770	10,591	9,006
Nov	13,021	18,089	10,226	—
Dec	9,075	28,043	5,878	—
YEAR	114,629	203,108	102,383	—

19 Non-Ferrous Convectors
Sold Complete, Sq. Ft.

	1935	1936	1937	1938
Jan	93,407	136,021	355,662	199,308
Feb	66,076	121,133	247,326	173,499
Mar	87,225	117,400	463,101	256,476
Apr	106,488	202,015	427,785	258,817
May	152,944	233,101	367,478	309,365
Jun	147,614	348,855	461,121	342,659
Jul	166,807	440,717	361,243	417,401
Aug	243,406	414,785	423,825	565,268
Sep	186,531	447,562	483,642	494,991
Oct	230,921	459,167	483,546	493,525
Nov	170,231	425,617	411,327	—
Dec	130,212	328,497	251,338	—
YR	1,781,862	3,674,870	4,737,394	—

20 Non-Ferrous Convectors
Sold Complete, Dollars

	1935	1936	1937	1938
Jan	29,029	52,848	101,249	69,374
Feb	23,827	41,189	77,988	55,364
Mar	30,876	39,998	142,114	90,197
Apr	39,378	67,569	149,741	89,620
May	54,926	78,870	133,450	101,433
Jun	48,510	115,807	148,996	113,115
Jul	53,748	148,408	119,607	126,308
Aug	77,399	136,911	138,698	171,205
Sep	61,487	134,277	156,434	149,620
Oct	77,569	141,883	154,047	156,840
Nov	55,845	136,271	133,243	—
Dec	47,444	97,277	81,087	—
YEAR	600,038	1,190,308	1,536,654	—

21 Non-Ferrous Convectors
Sq. Ft., Total Tables 17 and 19

	1935	1936	1937	1938
Jan	174,002	281,049	390,022	221,015
Feb	108,605	182,815	268,995	191,797
Mar	135,238	180,256	481,499	281,556
Apr	152,670	253,100	468,946	284,721
May	202,368	307,402	451,345	360,885
Jun	203,894	433,250	501,924	388,506
Jul	248,426	541,701	402,435	488,933
Aug	317,174	554,368	513,817	625,278
Sep	245,244	553,449	573,715	559,669
Oct	345,092	600,573	547,523	551,488
Nov	283,146	528,544	468,881	—
Dec	190,330	496,761	286,341	—
YR	2,606,189	4,913,268	5,355,443	—

22 Cast Iron Convectors
Sales, Sq. Ft.

	1935	1936	1937	1938
Jan	111,732	292,724	427,185	438,680
Feb	66,093	223,077	478,057	285,037
Mar	142,465	229,324	464,734	325,966
Apr	137,854	277,678	554,418	408,756
May	209,179	550,513	612,516	619,049
Jun	245,830	612,618	640,202	603,669
Jul	271,623	802,851	854,667	656,438
Aug	423,581	754,954	1,081,867	703,247
Sep	441,948	749,825	981,951	605,664
Oct	481,329	789,218	648,536	614,038
Nov	365,116	655,942	541,019	—
Dec	389,940	632,972	477,653	—
YR	3,286,690	6,571,696	7,762,805	—

23 Cast Iron Convectors
Sales, Dollars

	1935	1936	1937	1938
Jan	31,564	80,338	136,687	140,929
Feb	20,134	66,424	145,021	93,598
Mar	41,569	66,007	153,103	104,250
Apr	42,494	84,322	174,545	135,565
May	60,430	155,386	189,630	193,892
Jun	73,284	172,507	211,588	190,319
Jul	81,861	231,595	252,562	193,918
Aug	116,418	229,235	324,857	213,989
Sep	118,040	219,557	285,863	198,304
Oct	134,816	244,444	201,146	197,177
Nov	101,505	190,613	181,605	—
Dec	106,534	184,386	150,869	—
YEAR	928,649	1,924,814	2,407,446	—

24 Convectors, All Types
Total, Thousand Sq. Ft.

	1935	1936	1937	1938
Jan	286	574	817	660
Feb	175	406	767	477
Mar	278	410	946	608
Apr	291	531	1,023	693
May	412	858	1,064	980
Jun	450	1,046	1,142	992
Jul	520	1,345	1,257	1,145
Aug	741	1,309	1,596	1,329
Sep	687	1,303	1,556	1,165
Oct	826	1,390	1,196	1,165
Nov	648	1,184	1,010	—
Dec	580	1,130	764	—
YEAR	5,893	11,485	13,118	—

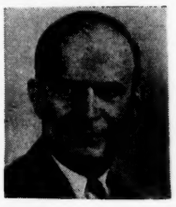
ments to show a rise in sales over 1937. The closely-related unit heater suffered severely in dollar sales, which were off 37%; at least a fair part of this drop was probably due to a price situation.

Among the various types of heating boilers the best comparative record was made by steel boilers which showed a drop of only 12% in numbers sold during 1938 below 1937. Cast iron sectional boilers declined 18.5%, while round boilers dropped 28.8%. Oil burner-boiler units suffered a 25.8 loss%.

The warm air furnace, which has been riding high for a long period, apparently is losing none of its popularity. Sales of oil burner furnace units in 1938 were 24.4% below those in 1937, but gas-fired furnace sales dropped only slightly, and may finish the year even with 1937. Statistics are meager on coal-fired furnaces, but it is estimated that sales are not off more than 12.5%, although this estimate does not take into account the operations of the large direct installer in this field. Cast furnaces accounted for the decline, with steel furnaces up.

All types of radiators and convectors had comparable losses in 1938. Direct cast iron radiator sales (in square feet) declined 20.8% as compared with a drop of 18.9% for all types of convectors. Cast iron convectors dropped 22% in square feet and 19.9% in dollars, indicating a firm price structure. Non-ferrous convectors declined least of all, 14%, in square feet.

Conversion type fluid fuel burners had a relatively bad year. Mechanical draft oil burner sales fell off 32.6% in 1938, natural draft burners were off 34%, and gas conversion burners dropped sharply. Solid fuel burners did well, relatively, since residential stoker installations were off only 6.0%, while small commercial stokers declined 22% and large commercial stokers 16.7%.



Heating with Anthracite in 1938

By ALLEN J. JOHNSON
Director, Anthracite Industries Laboratory

Equipment sales, manufacturer and consumer interest, and technical progress in anthracite heating all continued to advance to an encouraging extent during 1938.

In spite of a marked recession in many other lines of business, the sales trend of anthracite equipment continued upward at a rate that can mean only widely recognized public acceptance of anthracite as a modern medium for automatic heating.

In 1937, anthracite stoker sales were almost exactly twice those of 1936, whereas in 1938 a second doubling of the 1936 stoker sales volume is anticipated. As a natural result, practically all anthracite stoker manufacturers report overtime operations. Volume production has, in many cases, resulted in a marked decrease in stoker prices, a factor which will undoubtedly result in continued sales advances.

A number of manufacturers and retail outlets report a demand for anthracite equipment in territory which has heretofore been conceded to be outside of the normal anthracite consuming area. While this is probably partially due to the cleanliness and convenience offered by such equipment, it is also undoubtedly a reflection of the decreased equipment prices.

In the semi-industrial stoker field, many manufacturers are reporting an unprecedented demand for anthracite equipment. Several companies are actively offering new anthracite stokers in this class, whereas a number of others are planning changes to bituminous burning models which will enable anthracite to be burned and thus meet this demand.

From a technical angle, the most significant advance was undoubtedly the First Annual Conference on Anthracite which was held at Lehigh University in April. Eighteen comprehensive papers presented by eminent technicians and authorities included such subjects as reserves and geology; inherent characteristics and non-fuel uses; a new theory of the combustion of anthracite; practical considerations in connection with combustion; a discussion of such equipment as thermostats, magazine feeding, stokers, hand firing, and air conditioning; aspects of commercial utilization including a dicussion of pulverization, the use of anthracite for power, and a stoker for apartment houses; and papers on economics, merchandising, and civic values covering anthracite's distribution, methods of ash removal, the value of degree day calculations, the relation of fuel to civic cleanliness, and a statistical analysis of the industry.

As the success and attendance led to the announcement by President Williams of Lehigh that this Conference would be an annual event, plans are already being laid and papers scheduled for a second conference to be held on the 28th and 29th of April, 1939.

In the laboratories, the electrical ignition of stoker fires was brought to such a point of perfection that it is now being offered to interested stoker manufacturers; the electrical ignition of hand fires is nearing a point where it is believed that it will soon be commercially available; several types of hand fired and stoker kindlers have been developed; a rectangular retort to enable a more complete utilization of the grate area of sectional boilers is ready for a commercial application; a flexible ash conveyor capable of removing ashes to either an adequate storage closet or even to outdoors has been announced as being available to manufacturers. A miniature stoker having a maximum capacity of 2½ lb. of coal per hour and designed for use in replacing gas under side arm coils, and similar service water equipment, is also being manufactured upon a limited scale and is available to manufacturers and prospective distributors on sample orders.

Heating with Gas in 1938

By C. GEORGE SEGELER
Engineer of Utilization, American Gas Association

Taking advantage of the opportunities which were announced on these pages in January of last year, the gas industry forged ahead in house-heating sales more than 18%. Statistics covering the present status

of gas installations for the reporting companies are published separately in this issue, attention again being called to the large number of non-reporting gas companies whose total installations swell the extent of gas heating in the United States to surprisingly high figures. The entire heating and ventilating industry must be vitally interested in the market made up of more than two million homes already using gas. Divided into methods of use, there are 15 distinct types of gas appliances used for heating and air conditioning. The published statistics thus lead to an erroneous concept of the extent of this market. Gas heat is surprisingly versatile. It appears to fit more different kinds of heating problems than other methods and thus offers the heating and ventilating industry greater opportunity through a more diversified line of appliances.

Basing the estimate on the best figures available, it appears that at least 11% of the total of urban families in the United States are now using gas heating. It has long been felt that the best potential for gas heating sales was in the owner-occupied homes, but recent trends toward apartment house heating are changing this picture.

The successful installation of individual forced warm air heating furnaces in the Park Lane Apartment, Boston, reported last year, has been followed by a number of similar installations in apartment houses in other parts of the country, and there is every reason to believe that it marks the beginning of a new concept of apartment house design. In response to demand, there are now a large number of manufacturers producing automatic gas heating equipment of the closet type to fit this field.

The same type of unit has been installed in a substantial majority of the new small four-to-six room houses designed for families of low income. With improved construction, small heat losses, and the relatively short-duct runs which are required, gas competes most successfully with other fuels in a home of this type.

In some communities, two-story apartments are being built for 10 to 30 families each. A number of these have been designed for heating by individual gas boilers and radiators as well as by a closet type of furnace, already described. The location of these boilers in the kitchen, concealed behind a grille below the sink together with a water heater in the same location, is an example of the ingenious concentration of gas utility equipment in the home.

In the territories where "no basement" homes are typical, the gas floor furnace is used in increasing number. It is estimated that better than 100,000 were sold during 1937, of which about 95% went into single family dwellings, the remaining 5% being used in churches, stores, restaurants, and other commercial establishments. The method of use of these furnaces varies from partial heating in the south and southwest to complete space heating in cooler areas.

Among the many technical improvements which were made in equipment and accessories during the last year, the automatic lighting devices are of particular interest. These will be designed so that the customer can turn on his heat by pushbutton control from upstairs through the agency of an automatic lighting device. The purpose of this type of lighting equipment is to furnish gas users more completely automatic servince and, at the same time, to reduce the service costs to the gas company by eliminating the annual lighting and extinguishing service calls that are now required by many customers.

Although not a new development, the unusual growth of gas unit heater applications for factories, offices, and particularly for the heating of retail stores was an outstanding feature of 1938. Many of these outlets do not have adequate heating plants or none at all. Others have a schedule of operation which may not coincide with the use of the building. The gas unit heater is a self-contained device with practically no time-lag and consequently fits the needs of these establishments. There is every reason to believe that gas unit heater applications will continue to increase.

SUMMARY OF CHANGE IN STATUS OF GAS-FIRED CENTRAL HOUSE-HEATING INSTALLATIONS FROM JULY 1, 1937 TO JULY 1, 1938

	No. Reported as of July 1, 1938	Increase from July 1, 1937	
		No.	%
Total customers served	10,706,449	195,439	1.9
Gas designed jobs....	182,294	32,950	22.1
Conversion jobs	162,147	19,626	13.8
Total jobs	344,441	52,576	18.0

Figures are preliminary as reported by Statistical Dept. of American Gas Association and are for 280 utility companies reporting data for period, including 125 natural gas companies and 155 manufactured gas companies. Figures are thus incomplete as there are 1200 gas companies in the United States.

Heating with Bituminous Coal in 1938

By RALPH A. SHERMAN
Supervisor, Fuels Division,
Battelle Memorial Institute

Resistance of the stoker market to the downward trend of general business in 1938 was not due to any radical improvements in stoker designs but to the fact that the merits of automatic heating with coal are being impressed on the public mind. Prices were being gradually reduced in 1938, partly owing to the economies of improved methods of production and partly to increased competition.

The American Society of Heating and Ventilating Engineers announced the approval of its recently developed Testing Code for Stoker-fired Heating Boilers. Adherence to this code by testing laboratories will insure greater uniformity in reported data. Deserved recognition by the Society of the importance of heating with solid fuels was assured by the appointment and organization of a Technical Advisory Committee on Solid Fuels.

The adoption by the Stoker Manufacturers Association of a standard stoker rating formula for stokers burning 1200 lb. of bituminous coal or less per hour was an important forward step in insuring proper coor-

dination of the stoker, the boiler and connected load.

The program of research on the utilization of coal sponsored by Bituminous Coal Research, Inc., at Battelle Memorial Institute continued to produce worthwhile results. Further reports on the performance of various types of coal on typical stokers and on the effect of various adjustments of the stoker on its performance furnish the basis for improved performance. Technical Report No. 4 on the "Fundamentals of Combustion in Small Underfeed Stokers," published during 1938, gives the stoker builder information on the process of combustion that should lead to improved designs of stokers. In HEATING & VENTILATING was reported a series of tests of automatic air controls for small stokers that showed that these simple devices operate, in the main, satisfactorily.

How the rank and size of coal and the type of oil affect the amount of oil required for effective dustless treatment were answered by the continued research on this project. The relation of the characteristics of coals to their use in pulverized form was determined by an extensive survey of industrial plants.

The Coal Research Laboratory of Carnegie Institute of Technology in cooperation with the Consolidated Edison Company and Bituminous Coal Research, Inc., made an important contribution to the understanding of combustion on large underfeed stokers by an experimental investigation of the combustion process in a stoker at Hell Gate Generating Station, New York.

The National Warm Air Heating and Air Conditioning Association turned its attention to automatic heating with coal in a series of comparative tests of hand firing and stoker firing in its Research Residence at the University of Illinois.

Interest of coal and stoker dealers in technical knowledge on solid fuels and automatic heating accelerated. Appalachian Coals, Inc., held three outstandingly successful fuel engineering conferences during the year at Atlanta, Ga., Cincinnati, Ohio, and Kalamazoo, Mich. The Indianapolis Coal Merchants Association conducted a Combustion Institute and the Coal and Coke Merchants Credit Association of Cincinnati sponsored a coal and stoker course of seven sessions in which 170 were enrolled. The fuel engineers of member companies of the Chicago Coal Merchants Association inaugurated a series of periodic meetings for discussion of technical problems. More attention than ever before was paid to problems of utilization in the annual meetings of the various state coal merchants associations.

Successful conferences on coal and heating were repeated by the University of Michigan, the University of Wisconsin, West Virginia University, and Iowa State College, and Purdue University reopened its series of conferences on coal after a lapse of several years. Washington University, St. Louis, held its initial conference of this type. The Midwest Power Conference of 1938 was sponsored by Armour Institute of Technology with the cooperation of several midwest universities. The attendance of 200 to 400 eager listeners at each of these conferences insures that the available knowledge on the selection and utilization of coal for steam generation will become widespread and that an increase in the general average level of the performance of the moderate and small sized heating plant will result.

Oil Heating in 1938

By FRANK H. DEWEY
President, Oil Burner Institute

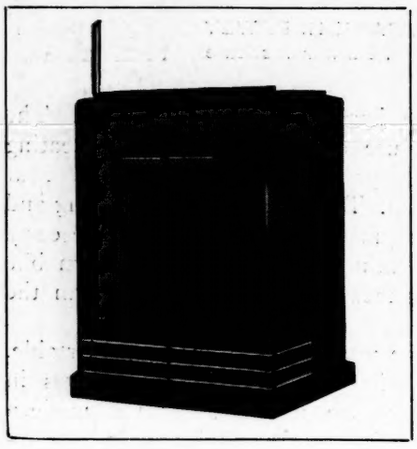
Oil heat is clean heat and economical heat. The steadily increasing use of fuel oil for home heating is indicative of the growing acceptance of oil heat throughout the nation. The present-day oil heating and air conditioning equipment is a far cry from the early efforts in the oil heating industry, as the automobile is, by far, a better means of transportation than the horse and buggy.

Today's homes are more modern, more comfortable, more healthful and hospitable, and better places in which to live. They are designed for the modern tempo of living. Designers and engineers in the oil-burning industry have kept pace with modern home design and construction, and have improved oil-burning equipment in many conspicuous ways. During 1938, manufacturers of oil-burning equipment made definite advancements in the performance and in the functional design of their products, and in addition rendered a better and a more satisfactory type of service.

The net result of all these advancements is that today even the modest homeowner is using fuel oil for heating. Years ago oil for heating was considered a decided luxury and oil-burning equipment was installed almost entirely by the rich. Since then, however, manufacturers have made it possible for small homeowners to equip their homes with automatic oil heating and air conditioning equipment. Recent statistics show that the mass field for sales of oil-burning equipment lies in the $800 to $2400 income group.

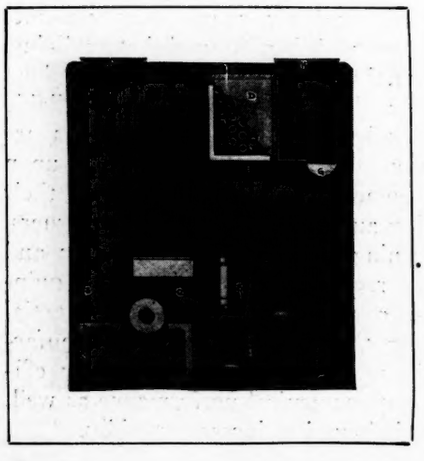
Leading manufacturers now, more than ever before, recognize the necessity of offering complete oil heating and air conditioning systems. Boilers and burners are engineered as coordinated boiler-burner units with highly modern, streamlined cabinets enclosing modern mechanism. The forced warm air furnace, with the oil burner as an integral part, is combined in one efficient unit which filters, circulates, warms and humidifies the air automatically. Drudgery is entirely absent.

Automatic oil heating is a familiar term. The oil heating industry constitutes a vast growing business of national import. Today, most everyone realizes that automatic oil heating and air conditioning promote better family comfort and health, and better living. The public, at large, has accepted automatic oil heat and air conditioning. Today, according to available statistics, approximately 25% of the new homes are equipped with automatic oil heat. Thousands upon thousands of old homeowners are modernizing their furnaces by installing automatic oil-conversion burners. There is an oil-burning unit for every domestic and commercial heating requirement. Oil-burning equipment manufacturers, realizing the tremendous potential demand, are alert to the situation and are manufacturing higher grade equipment, to give not only efficient performance, but economical performance as well. Fuel oil for heating is bound to increase rapidly.



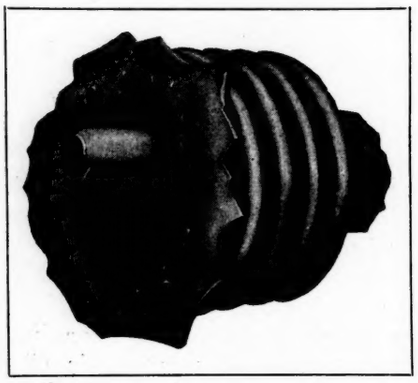
Dunham Heating System

NAME—Dunham Sav-T-heat system.
PURPOSE — For heating buildings using gas as a fuel.
FEATURES — This heating system is unusual in that the products of combustion from the gas burner are mixed with water vapor and then passed through the radiators. The steam in this mixture condenses and flows back to the boiler while the flue gases are exhausted through a stack to the outside. This system is available either in the form of a warm air system or radiator system. With either the operating principle is the same. Gas is burned in the combustion chamber of the generator and is then drawn into the mixing chamber which contains water. Here the hot gas and water form a gas vapor combination. This mixture leaves the generator at a temperature slightly below 212F and is drawn into the supply main and then to the radiators. In the radiators the heat of the mixture is extracted and distributed into the room. The gas is cooled and the water vapor condenses. The condensate flows by gravity back into the water compartment where the excess water overflows to the sewer while the non-condensable gases are discharged into the copper vent tube of the system and thence to the atmosphere above the roof line. A special exhaust fan maintains a slight vacuum on the return from the radiators so that there is a positive draft on the burner at all times and so that the mixture will flow through the radiators. The manufacturer claims that a high combustion efficiency is obtained and because no chimney is used there is no danger of downdrafts decreasing the efficiency. It is said that this system operates with from 90 to 95% efficiency in actual field use.
CAPACITY—100,000 B.t.u. per hr. input.
LITERATURE AVAILABLE — Form No. 301.
MADE BY—*C. A. Dunham Co., 450 E. Ohio St., Chicago.* *1*

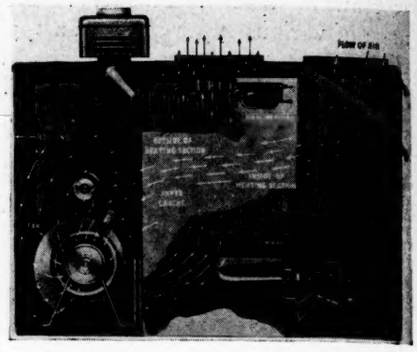


Badger Pipe Line Flexible Seal

NAME—Pipe line flexible seal.
PURPOSE—For making watertight and leakproof the opening where steam piping passes through foundations or walls below ground or flood level.
FEATURES—This device is made up of a flexible member which is corrugated by a special process from a single tube. One end of the seal is fitted with a nipple that can be welded to the outside of the pipe which is to pass through the wall. The opposite end can be fitted with either a nipple for welding or a flange for bolting to



bulkhead, deck or wall plate. If it is desired, this fitting can be furnished with a special combination sleeve and flange for grouting into a flood wall. This seal is said to make it possible for piping to be carried through bulkheads, decks or walls with allowance for expansion, contraction, lateral displacement and vibration while at the same time providing a watertight connection. These seals are manufactured in both ferrous and non-ferrous metals.
LITERATURE AVAILABLE—Bulletin No. 300.
MADE BY—*E. B. Badger & Sons Co., Boston, Mass.* *2*

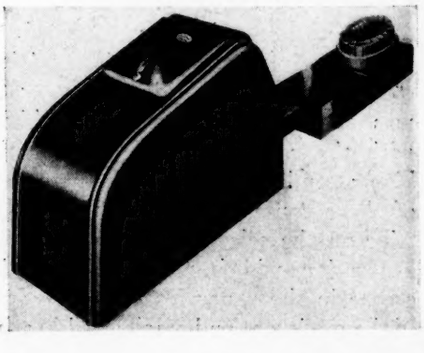


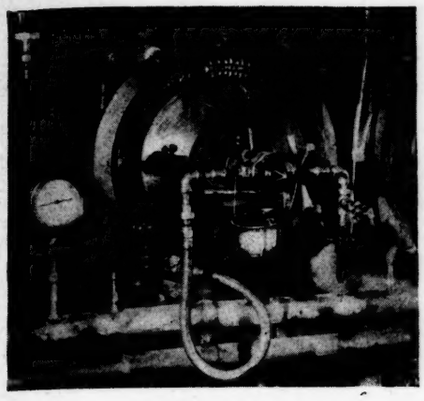
Crane Warm-Air Conditioner

NAME—Crane gas-fired warm-air conditioner.
PURPOSE—For heating, circulating, humidifying and cleaning air.
FEATURES—Intake air sweeps through an outer housing of the conditioner, enveloping the inner or heating compartment, and picks up the heat which escapes from the heating compartment. The heating fins within the heating compartment have been staggered to further increase the heat transfer. Units are available with from two to six sections with each section having its own burner controlled in unison with the burners in the other sections by a master control system.
SIZES AND CAPACITIES—Five sizes with input capacities ranging from 100,000 to 300,000 B.t.u. per hr.
MADE BY—*Crane Co., Chicago.* *3*

Peerless Stoker

NAME—Peerless stoker.
PURPOSE—For automatic burning of coal.
FEATURES—Some of the more important features of this stoker are continuous feed, gear transmissions with three rates of coal feed, hood soundproofed with plastic material, automatic air control and specially adapted wind boxes to suit practically all furnace and boiler installations, sectional tuyeres designed to prevent smoke backing up in the hopper, and completely sealed hoppers. Stoker is finished in a blue-green lacquer.
MADE BY — *Peerless Manufacturing Corp., Louisville, Ky.* *4*



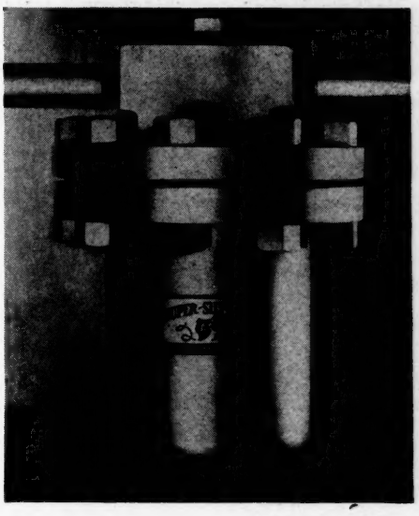


Todd Variable Capacity Burner

NAME—Todd variable capacity mechanical pressure atomizing burner.
PURPOSE—For delivering fully atomized oil to combustion chamber.
FEATURES—Manufacturer states that this burner operates with high combustion efficiency over a wide range of firing rates—a range of 20 to 1 or higher—and that this wide range is obtained without changing burner tips, pump delivery pressure, efficiency of atomization at any firing rate, or the angle of spray. Further, this burner is said to maintain constant steam pressure regardless of the demand and that it allows the boiler to follow the sudden and widely varying steam load requirements such as are encountered in both process and heating plants. Burner operates at 300 lb. working pressure. The burner is said to be fully adaptable to automatic control and so designed that any number of burners could be controlled in battery from a single valve. Capacity curve of the burner is said to be a straight line as is the air-flow curve. This straight line permits keeping a constant ratio of fuel to air throughout the entire range of operation. The design is said to be in effect a double burner—a mechanical atomizer, and an ingenious device for reducing the quantity of the atomized oil delivered to the combustion chamber. It is said that this burner permits changing the firing rate instantly, by either manual or automatic means.
SIZES AND CAPACITIES—The single burner has a capacity range from 15 to 1000 lb. of oil per hour.
MADE BY—*Todd Combustion Equipment, Inc., New York.* 5

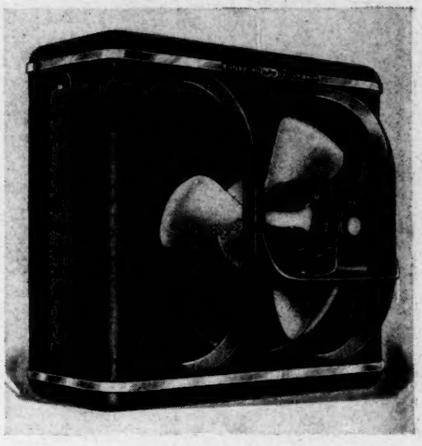
Anderson Steam Trap

NAME—Super-Silvertop forged steel series steam traps.
PURPOSE—A high-pressure steam trap which incorporates the Super-Silvertop features of economy, simple piping, accessibility, and capacity.
FEATURES—These traps are installed straight-in-line using the side inlet connection, or as an elbow using the inlet at the top of the trap. In either installation there are only two threaded joints required. These traps are said to average 122% more capacity than the old style Anderson forged steel traps. Traps are designed for pressures from 150 to 700 lb. per sq. in. The case and head are made of forged steel and gasket joints are of the recess type to prevent any possibility of gasket blow-outs. Valve and seat are made of Anderloy, a special chrome alloy, to reduce corrosion. All other parts are made of stainless steel. All traps are tested under a 1400 lb. pressure.
CAPACITIES—Capacities range from 2800 to 11,000 lb. of condensate per hour.
MADE BY—*The V. D. Anderson Co., 1935 W. 96th St., Cleveland.* 6



Buffalo Forge Unit Heaters

NAME AND MODEL NUMBER—Breezo-Fin unit heater, Model C.
PURPOSE—For heating air.
FEATURES—Heater element is made of one-piece, seamless copper tubing with square, copper fins, spaced to give maximum radiation. The manufacturer states that because there is only an inlet and discharge joint, both outside of the unit, there is no possibility of leakage inside the unit. The fan is of heavy steel construction and is designed to give increased capacity with less air noise. Louvers are of pressed steel and are curved to deflect the heated air with minimum friction. They are adjustable so that the air may be given any desired deflection. Standard equipment motors are either constant speed single phase, three phase, or direct current. Two-speed motors for single cycle or direct current are available. The casing is streamlined and is finished in a dull luster brown metallic color. Rubber silencers on the motor feet provide for



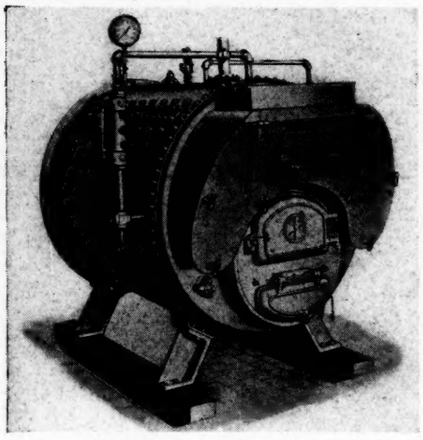
quiet operation. Invisible threaded hangers at top of the unit are said to make installation easy.
SIZES AND CAPACITIES—Five sizes with capacities ranging from 125 to 1083 E.D.R. and air deliveries of 554 to 3550 c.f.m.
LITERATURE AVAILABLE—Bulletin No. 3137.
MADE BY—*Buffalo Forge Co., Buffalo, N. Y.* 7

Autovent Warm Air Booster Fan

NAME—Booster fan.
PURPOSE—For increasing efficiency of warm air gravity systems.
FEATURES—Fan is designed for installation at the base of the cold air return duct at the point where it contacts the furnace. It is equipped with patented deflector plates and is designed to prevent air pockets at any point along the furnace base. The forced air action moves the heated air out of the furnace and distributes it to the rooms in the house.
MADE BY—*Autovent Fan & Blower Co., Chicago, Ill.* 8

Everite Hot Water Circulators

NAME—Everite hot water circulators.
PURPOSE—For providing forced circulation in hot water heating systems.
FEATURES—Circulator consists of a motor and direct drive pump and is designed to be installed at the point where the return enters the hot water boiler. Unit may be installed in any position. Manufacturer states that the unit is entirely leakproof due to the method of combining a seal and stuffing box. Oiling is not required for any part except the motor which should be oiled once a year. Circulator is equipped with a thermal overload control.
SIZES AND CAPACITIES—Four sizes, 1 to 2 in. with maximum delivery capacities ranging from 20 to 75 g.p.m.
MADE BY—*The Everite Pump & Mfg. Co., Inc., Lancaster, Pa.* 9

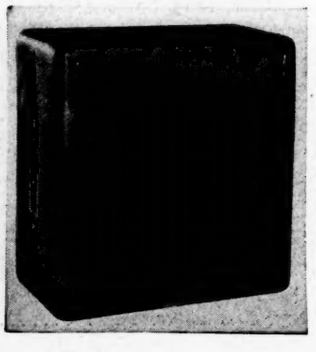


Kewanee Boiler

NAME—Kewanee Scottie Junior Scotch marine boiler.
PURPOSE—For supplying steam at pressures up to 100 lb. per sq. in.
FEATURES—The manufacturer states that this boiler offers high efficiency with low installation cost and a large load-up capacity for the small floor space occupied. The boiler is constructed of a flange steel shell of a cylindrical shape which has one longitudinal joint, double riveted, double butt strap. The tubes are of 12 gage Cop-R-Loy. No brick work is required as the precast refractory insulating blocks are fitted in place at the factory. The boiler is shipped complete with accessories mounted on wood skids and is said to need no foundation settings. Available for burning coal, oil, or gas.
SIZES AND CAPACITIES—Five sizes ranging from 1400 to 4200 sq. ft. of steam radiator surface.
LITERATURE AVAILABLE—Catalog 99.
MADE BY—*Kewanee Boiler Corp., Kewanee, Ill.* *10*

Young Unit Heaters

NAME—Young unit heaters.
PURPOSE—For space heating.
FEATURES—Numerous changes have been made in the new line of Young unit heaters. The steel casing is now made in one piece of welded construction to minimize vibration and eliminate rattles. The units are finished in a deep brown crackle trimmed in chrome. The core depth has been increased 33 1/3% over corresponding models of last year and a more liberal fin spacing gives a larger volume of air at lower temperature. Entire heating unit motor and fan is assembled separate and insulated from the casing to overcome all motor vibrations and expansion and contraction stresses.
SIZES AVAILABLE—Twenty-four single units and four twin units ranging in capacities from 18,000 to 658,000 B.t.u. per hr.
MADE BY—*Young Radiator Co., Racine, Wis.* *11*

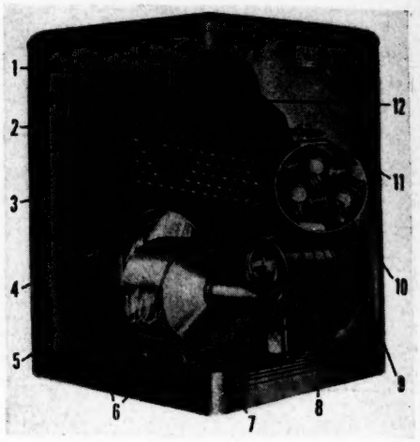


Yeomans Condensation Pump

NAME—Yeomans Hot Shot condensation pump.
PURPOSE—For returning condensate to steam boiler.
FEATURES—The operating unit of this device is the Yeomans Motopump which has a balanced bronze impeller mounted on a rustproof steel motor shaft. It is equipped with sealed grease-lubricated ball bearings and a special shaft seal. The receiver is welded copper bearing steel. Adjustment of the float on the float switch is made from outside of the receiver. Unit is shipped complete ready for pipe and electrical connections.
CAPACITIES—Capacities range from 1½ to 25 g.p.m.
MADE BY—*Yeomans Brothers Co., 1433 Dayton St., Chicago.* *12*

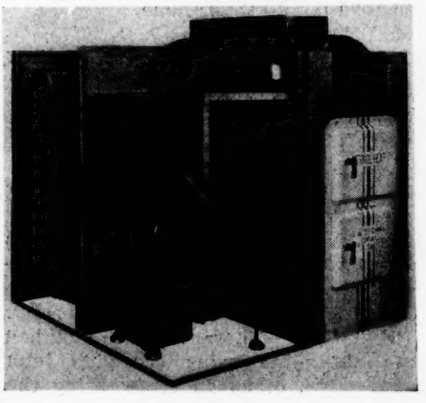
Delco-Frigidaire Boiler

NAME—Quik-action oil furnace.
PURPOSE—For generating steam and hot water using oil as a fuel.
FEATURES—This oil boiler is a complete boiler-burner unit. The central feature is a metal unit resembling a drum which is built around the area of actual combustion. This unit is called a heat transmitter and is said to reach a temperature of approximately 1500F within 40 to 50 seconds from the time the motor starts. This rapid heating-up period is said to be approximately one-eighth of the conventional time which results in the elimination of fuel wastage represented by incomplete combustion during the long warming-up period. The hot flue gases pass over a network of metal fins directly attached to the walls enclosing the water. These fins are streamlined in design. The manufacturer states that all water channels have been designed to eliminate angles and obstructions of every kind to facilitate rapid water movement. The Delco rotopower unit is standard equipment. In the illustration: (1) refers to the water or steam outlet; (2) the shredder pins; (3) water-backed fins; (4) exhaust end flames traveling upward; (5) streamlined water channels; (6) firebox surrounded by water; (7) heat transmitter; (8) oil burner; (9) thin-mix fuel control; (10) streamlined fins; (11) baffle plate; and (12) salvage fins.
MADE BY—*Delco-Frigidaire Conditioning Div., General Motors Sales Corp., Dayton, Ohio.* *13*



Schwitzer-Cummins Conditioner

NAME—Schwitzer-Cummins conditioner.
PURPOSE—For supplying warm air using automatically fired coal as a fuel.
FEATURES—Conditioner consists of a stoker furnace, Stokol stoker, blower-filter air cleaner and circulator, and humidifier built into a single cabinet. The stoker furnace is a steel welded unit and resembles the construction of a water tube boiler. There are no cemented seals and a clinker compartment and clinker removal bucket have been provided for convenience in cleaning the fire.
SIZES AND CAPACITIES—Two sizes, Model 200, maximum rating 200,000 B.t.u. per hr. at bonnet, nominal rating 130,000 B.t.u. per hr.; Model 300, maximum rating 300,000 B.t.u. per hr. at bonnet, normal rating 200,000 B.t.u. per hr.
MADE BY—*Schwitzer-Cummins Co., 1125 Massachusetts Ave., Indianapolis, Ind.* *14*



Furblo Blower

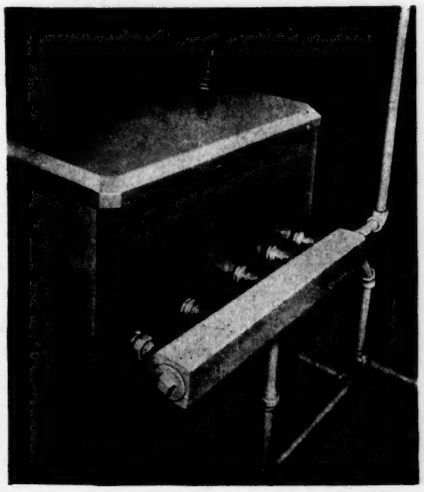
NAME—Furblo blower with a dual motor mounting.
PURPOSE—To enable the user to mount the motor on the top or rear of blower.
FEATURES—Motor can be mounted either on top or at the rear of the blower as the customer desires. It is merely a matter of changing a cross rod from one position to another. This feature is available on the standard Furblo blower in 10, 12, 14, 16, or 20 in. sizes.
LITERATURE AVAILABLE—Form 8-1.
MADE BY—*Furblo Co., Hermansville, Mich.* *15*

Young Forced Convector

NAME AND MODEL NUMBER—Young forced convector type FC.
PURPOSE—For use with steam or hot water systems for heating entrance halls where unit heater operation is desired with convector appearance.
FEATURES—Consists of two multivane fans and one direct connected motor of either constant or two-speed type. Can be used with either steam or hot water systems. Has a brown crackle finish.
SIZES AND CAPACITIES—Three sizes, 27,000 B.t.u. per hr. in the small size; 72,000 B.t.u. per hr. in the medium size, and 102,000 B.t.u. per hr. in the large size.
MADE BY—*Young Radiator Co., Racine, Wis.* *16*

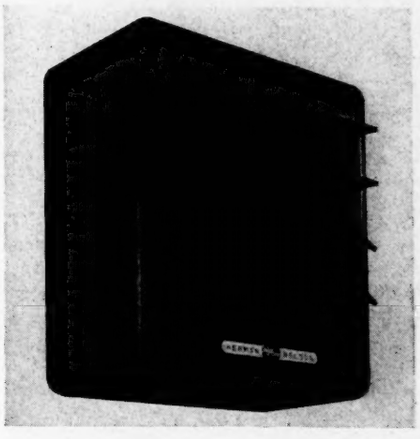
Taco Water Heater

NAME—Taco flexible header heater.
PURPOSE—A combined boiler header and hot water heater for supplying domestic hot water.
FEATURES—In many cases the construction of the sectional cast iron boiler is such that when installing an indirect heater it is necessary to first provide for free circulation between the sections by means of a header connected to each section which in turn is connected to the heater. This is done to prevent the steaming in one section alone. This heater is so constructed that it may be used in place of the header, thus reducing installation and operating costs. Only the connection to one section is made rigid, the other sections are connected to the heater by means of flexible bellows.
SIZES AND CAPACITIES—Seven sizes with capacities ranging from 40 to 144 gal. per 3 hr., 100F rise with 212F boiler water.
MADE BY—*Taco Heaters, Inc., 342 Madison Ave., New York.* *17*

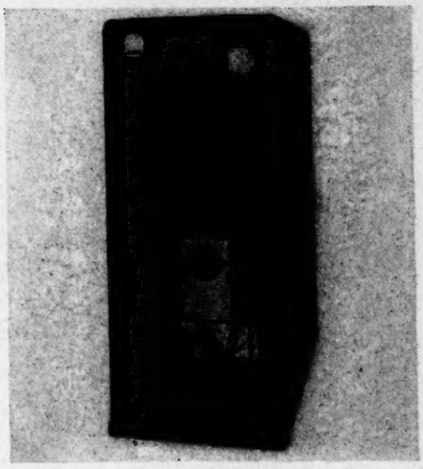


Herman Nelson Unit Heater

NAME—Herman Nelson propeller-fan type hiJet heater.
PURPOSE—For steam or hot water heating of all types of industrial and commercial buildings.
FEATURES—Fan of new streamlined design with large face area, combines quieter, smoother operation with increased efficiency. Heating element is designed with loops to absorb difference in expansion and contraction between individual tubes. Entire tube and loop is fabricated of red brass with no connecting joint. Tubes project from side of supply header, above center line, to assure proper distribution of steam. A patented stay tube maintains proper relationship between headers. Motor, for single, two or three speed operation, and fan assembly are mounted on steel arms designed to absorb and dissipate torsional vibration preventing transmission of vibration to cabinet. Louvers are adjustable and curved to direct heat downward. Grille or discharge nozzle may be used in place of louvers. Cabinet, of attractive, rounded design, is built of heavy gage sheet steel and finished in steel grey "Morocco." The hanger and steam connection are located near the center of gravity for ease of installation.



SIZES AND CAPACITIES—18 sizes for use with steam or hot water. Air capacities ranging from 275 c.f.m. to 5060 c.f.m.
MADE BY—*The Herman Nelson Corporation, Moline, Ill.* *18*

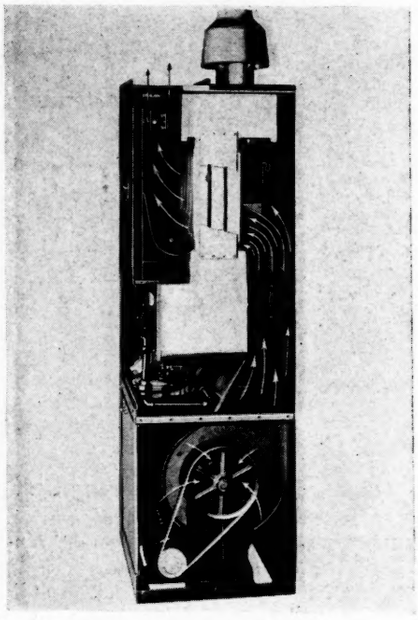


U.S. Winter Air Conditioning Unit

NAME—Capitolaire conditioning unit.
PURPOSE—For winter air conditioning using oil as a fuel.
FEATURES—This winter air conditioning unit is furnished complete with oil burner, room thermostat and automatic humidifier assembled in one crated unit ready for chimney connection. Each unit has been under fire and electrically tested before shipment is made.
SIZE—100,000 B.t.u. per hr. at register.
MADE BY—*U. S. Radiator Corp., 44 Cadillac Sq., Detroit, Mich.* *19*

Coreco Boiler

NAME—Coreco water agitated boiler.
PURPOSE—For supplying steam or hot water using either oil, gas, or coal as a fuel.
FEATURES—Flue gas travel is from the bottom center to the outside and then back to the top center. The water travel is from an "agitator" at the lower cross section to the center where it is then distributed evenly to both sides, then to the steam dome. It is said that steam bubbles forming in the agitator move rapidly upward giving the necessary turbulence required to expose a greater amount of water to the boiler surface. Manufacturer claims that the refractory brick combustion chamber recovers the latent heat during the off firing periods. The boiler is made of grey iron sections assembled by slip nipples and draw bolts. Included with each boiler are high temperature cement and insulation for the combustion chamber, rock wool blankets for boiler insulation and a jacket, trim and all controls. An opening in the rear is said to accommodate any oil or gas burner. Domestic hot water is available from a below-the-water-line heater which is supplied as extra equipment.
SIZES AND CAPACITIES—Nine sizes with steam radiation ratings from 460 to 2350 sq. ft.
MADE BY—*Coreco, Inc., Chandler St. at Bridgman, Buffalo, N. Y.* *20*

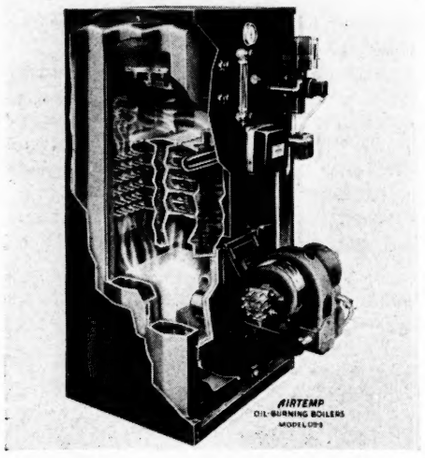


Bryant Forced Warm Air Heater

NAME AND MODEL NUMBER—Bryant VB-8 forced air gas heater.
PURPOSE—A compact gas heater for supplying forced warm air.
FEATURES—Heater may be placed wherever space is available, in a corner of a room, in the basement, or in a closet. When it is placed on the same level as the heated space, the unit is installed right over the return air duct. Heater requires 4 sq. ft. of floor space. Air enters through the bottom of the unit and then is drawn into a blower. Baffles then guide it through a chrome-alloy heat-exchanger. Warm air is discharged to a duct at the top.
CAPACITY—75,000 B.t.u. per hr.
MADE BY—*The Bryant Heater Co., Cleveland, Ohio.* 21

Airtemp Boilers

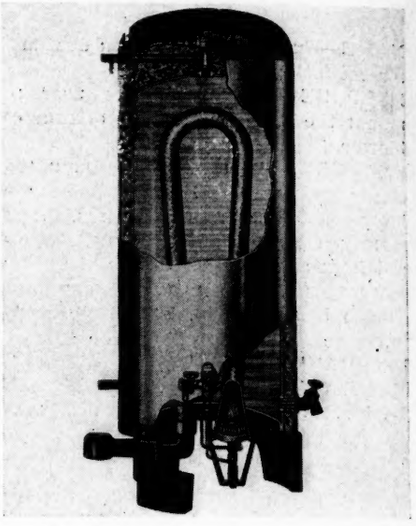
NAME—Airtemp oil-burning and gas-burning boilers.
PURPOSE—For supplying steam or hot water using oil or gas as a fuel.
FEATURES — Boilers are designed especially for burning oil or gas and are furnished complete with oil burner or gas burner. The boiler heating section is constructed of cast iron with finned elements or baffles. The fin elements in the flue gas passages are arranged in staggered rows. A water line 44 in. from the floor makes the boilers suitable for applications where head room is a prime factor. Standard accessories furnished with the boiler include steam gage, safety valve, gage glass and fittings, and tri-cocks on the steam boilers; combination altitude gage and thermometer on the water boilers. On the oil boilers the controls furnished as standard equipment include the primary control and safety limit control on the steam boilers and a water limit control on the water boilers. On the gas-fired boilers a magnetic gas valve, gas regulator and control and thermostatic pilot are provided. Built-in water heater for domestic hot water is also provided. The oil boiler has incorporated in it a combustion chamber of chrome rustless steel. This chamber is suspended within the firebox and permits complete circulation of combustion gases around the entire chamber. Illustration shows one of the Airtemp oil-burning boilers.



SIZES AND CAPACITIES—Oil boiler burners in six sizes with capacities ranging from 96,000 to 408,000 B.t.u. per hr. at the header. The gas boilers are available in four sizes with capacities ranging from 96,000 to 252,000 B.t.u. per hr. at the header.
MADE BY—*Airtemp, Inc., Dayton, Ohio.* 22

Janitrol Water Heaters

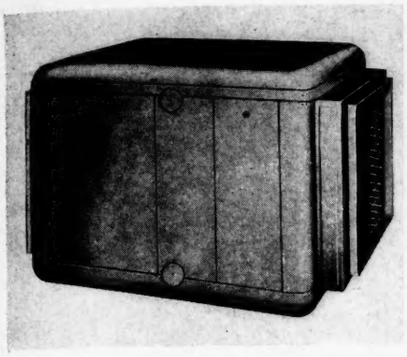
NAME—Janitrol thrift water heaters.
PURPOSE — For supplying domestic hot water using gas as a fuel.
FEATURES — The gas input to this heater can be set in accordance with the individual user's hot water requirements. This, the manufacturer claims, establishes in advance the monthly gas bill for water heating, assuring hot water service at a budgeted cost which cannot be exceeded. Three of the principal features of the heater which are said to give efficient operation are: (1) effective heating by passing the heat slowly through the water. This is accomplished by a long inverted U-shaped heating element within the tank through which pass the hot gases from the burner; (2) a small burner located in one end of the heating tube and regulated to burn just enough gas to replenish the hot water supply only as fast as it is normally consumed; (3) a large capacity, heavily insulated, hot water storage tank. The same burner is used on all models and is supplied by the manufacturer with any specified input from 3500 to 10,000 B.t.u. per hr. If it is desired to set the input on the job, the burner orifice comes drilled for 10,000 B.t.u. input and the exact desired input is then set by thermostatic adjustment when the heater is installed. When a gas pressure regulator is used the burner is available with 12,500 B.t.u. per hr. input.



SIZES AND CAPACITIES—Three sizes with storage capacities of 30, 45, and 60 gal.
MADE BY—*Surface Combustion Corp., Toledo, Ohio.* 23

Sunbeam Air Conditioner

NAME AND MODEL NUMBER—Sunbeam Series S air conditioner.
PURPOSE—A stoker-fired conditioner for winter air conditioning.
FEATURES—Unit is designed for hopper and bin-feed stokers. The heating element is provided with openings so that no cutting is required to install the stoker from the front, rear, or either side. Special model is available for installation of stoker below floor level. A large double radiator is said to accommodate an unusually large accumulation of fly ash without reducing the rated heating capacity of the unit. Under average conditions and with the use of certain grades of coal, it is said that fly ash need not be removed even once during the heating season. A clinker compartment is located between the front casting and firepot. As the clinkers are removed from the fire bed they are dropped into the clinker pan which is located in this compartment and which can be removed and emptied after clinkers have cooled and odorous gases have passed out the flue.
SIZES AND CAPACITIES—Two sizes with ratings of 150,000 and 200,000 B.t.u. capacity at the register.
MADE BY—*The Fox Furnace Co., Elyria, Ohio.* 24



Trane Humidifying Conditioner

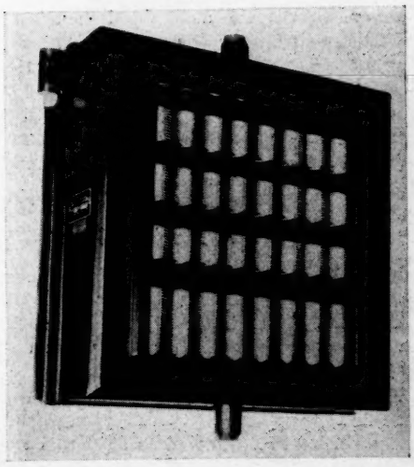
NAME — Trane humidifying conditioner.
PURPOSE—For humidifying and tempering air.
FEATURES—This device has a capacity of 300 c.f.m. of air which is said to be sufficient for an average seven- or eight-room house. It is constructed of 18-gage quality steel sprayed with a rust-resisting paint. An extended surface coil with tubes expanded to fins is used for tempering. A four-blade propeller fan is used to force the air through the unit. Humidification is provided by a target type spray nozzle. Air filter to clean the air is of the throw-away type. Humidifying conditioner requires connection to existing heating system whether steam or hot water and to a water supply and waste line. Unit is housed in a steel cabinet coated with gun metal enamel and can be suspended from a basement joist. One supply and one return duct to the room above are usually enough.
LITERATURE AVAILABLE—Bulletin No. 273.
MADE BY—*The Trane Co., La Crosse, Wis.*.....*25*

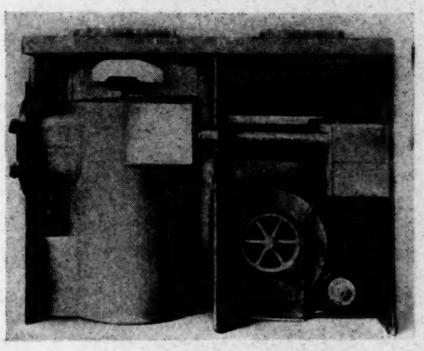
Arco Thermo Heating System

NAME—Arco thermo heating system.
PURPOSE — A warm water heating system utilizing radiators and fans for air distribution in the rooms.
FEATURES—System is a completely automatic forced circulation warm water system, including a pump which accelerates the circulation of water through the piping and thermo units. The boiler may be fired either by oil burner, coal stoker, or gas burner. Warm water is distributed through copper pipes to the room heaters which are called Arco thermo units. The Arco thermo units are composed of a radiator and fan driven by a compressed air motor. This air motor, which is said to be thin, compact, and dirt-proof, makes it possible to conceal the motor element within the narrow limits of an ordinary building wall. Radiator and fan are assembled into a galvanized steel box 10 in. wide, 14 ½ in. high, and 4¼ in. deep, recessed flush with the wall and off the floor. All piping connections are made within this box, which is covered with an ivory enamel grille. Air is supplied to the motors through a single small diameter copper pipe by a motor-driven air compressor and storage tank located in the basement. A speed control on each motor makes it possible to regulate the amount of heat given off by each radiator. System consists of an Ideal warm water boiler, copper pipe and copper fittings, water circulator, float control valve, expansion tank, air supply unit, thermostat, relay, and thermo unit. The Arco thermo units are made in one standard size of 50 sq. ft. equivalent cast iron radiator capacity. For rooms requiring less than 50 ft., capacity is reduced by reducing fan speed. Additional units may be used for more than 50 ft. Manufacturer claims the following advantages over conventional systems: More floor space, instant response to heat thermostats, prevention of drafts, and the lowering of room temperature differential.
MADE BY—*American Radiator Co., New York.*.....*26*

Airtherm Unit Heater

NAME—Airvector.
PURPOSE—For space heating.
FEATURES—The case of this unit incorporates reinforcing beads running completely around the unit to give it strength and to prevent any vibration. The unique cradle suspension of the motor is said to prevent pendulum action on starting and stopping the motor and also deadens any motor hum.
SIZES AND CAPACITIES — Twenty sizes ranging from 74 to 1240 sq. ft. of equivalent direct radiator surface.
MADE BY—*Airtherm Manufacturing Co., St. Louis Mo.*.....*27*





Fitzgibbons Winter Air Conditioner

NAME AND MODEL NUMBER—Fitzgibbons Special 80 Directaire.
PURPOSE—A direct-fired air conditioner designed for oil, gas, or stoker firing to provide cleaned, warmed and humidified air.
FEATURES—Unit consists of a steel furnace, a double inlet squirrel cage fan, throw-away filters, humidifying device and a jacket. Steel furnace is constructed of heavy copper boiler plate steel plates and tubes with all joints and seams exposed to the air stream welded. Units are shipped assembled with the inner casing, humidifying equipment and fan control in place. If desired, the unit may be adapted for summer cooling by the addition of a compressor and cooling coils. May be furnished with a jacket enclosing the automatic firing equipment or a standard jacket.
SIZES AND CAPACITIES—Two sizes, capacities of 80,000 and 100,000 B.t.u. per hr. at the bonnet.
MADE BY—*Fitzgibbons Boiler Co., Inc., New York.*.....*28*

Magnus Oil Sludge Preventor

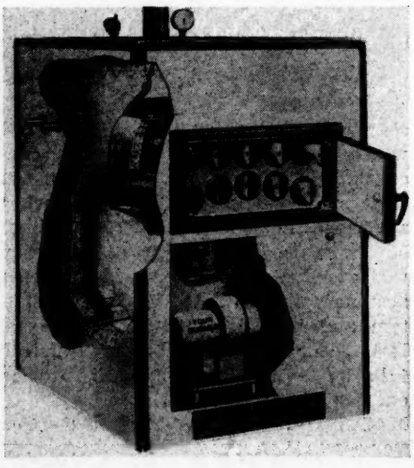
NAME—Clerex.
PURPOSE — To prevent water and sludge accumulation and stop rusting in fuel oil supply systems.
FEATURES—The manufacturer states that Clerex is an oil soluble penetrating and dispersing agent, crystalline in form. It is claimed to be active in preventing sludge, in oil concentrations between 0.01% and 0.015%. To clear existing sludge the oil is treated with sufficient Clerex to give a concentration of about 0.03% in the oil. It is added to the system by pouring a charge in the tank before filling. Manufacturer also claims that Clerex will gradually dissolve the gum which accumulates on the tank sides and bottom and in the strainers and valves. It is recommended that approximately 1 lb. be used to each 400 gal. to clear out fouled tanks.
MADE BY—*Magnus Chemical Co., Garwood, N. J.*.....*29*

Sterling Trap

NAME AND MODEL NUMBER — Float and thermostatic trap, No. 69.
PURPOSE—A small float and thermostatic trap for handling the condensation of unit heaters, unit ventilators, mains or risers, or small blast coils.
FEATURES—Trap is said to be unusually compact and is supplied with two inlet tappings and two outlet tappings, making four different connections possible. Seat and valve cone are made of stainless steel. As all piping connections enter the cover which carries the bellows type thermostatic members, the body can be removed for cleaning by removing four head screws.
SIZES AND CAPACITIES — One size with capacity 200 lb. of water per hr.
LITERATURE AVAILABLE—Bulletin No. 69.
MADE BY—*Sterling Engineering Co., Milwaukee, Wis.* *30*

Kewanee Steel Heating Boiler

NAME AND MODEL NUMBER—Steel heating boiler No. 1737.
PURPOSE—For heating medium sized homes and small buildings and for furnishing domestic hot water. For use with either oil or gas.



FEATURES — Unit consists of the Round R boiler enclosed in a Smartline jacket. This unit has two-pass tubes. A 75-gal. Kewanee copper coil is standard equipment. Also available with a larger tank coil of 200 gal. capacity or an instantaneous coil of 250 gal. capacity at an additional charge. A Rex Smartline jacket is used for short gun burner enclosures and a Regal jacket for complete gun burner enclosures.
CAPACITIES—900 sq. ft. heating surface net load.
LITERATURE AVAILABLE — Circular RM-92-1.
MADE BY — *Kewanee Boiler Corp., Kewanee, Ill.* *31*

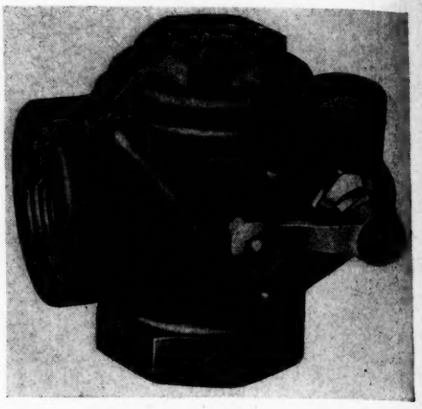
Thrush Water Heater

NAME — Thrush Kleen-Tube water heater.
PURPOSE — For supplying domestic hot water utilizing boiler water.
FEATURES—This water heater is made of straight tubes. The use of straight tubes is said to reduce the possibility of lime and sludge deposits in the heater and to make the heater tubes more easily accessible for inspection and cleaning. The heater is designed to be installed in a horizontal

position, thus reducing considerably the vertical dimensions of the heater. This increases the normal rate of circulation and is said to make possible increased capacity because the heater can be installed in the highest heat zone of the boiler. All parts of the heater are made of copper or bronze. The heating element consists of drawn seamless copper case, cast iron bronze headers, and drawn seamless copper tubes. These are assembled in a heat exchange unit that is said to be leakproof. It is possible to remove the rear header of the heater without disturbing any of the pipe connections.
MADE BY—*H. A. Thrush & Co., Peru, Ind.* *32*

Taco Flow Check Valves

NAME—Taco flow check.
PURPOSE—A check valve for use with Taco hot water heating system to prevent the circulation of water when the circulator is not operating.
FEATURES—This flow check is of the angle type with all brass moving parts. Easy manual operation is said to be a



special feature. This valve also provides an opening for the expansion tank take-off.
SIZES—Two sizes, 1¼ and 1½ in.
MADE BY—*Taco Heaters, Inc., New York.* *33*

Hoffman Radiator Vent Valves

NAME AND MODEL—Radiator vent valves, 40 series.
PURPOSE—Low-priced, quick venting, radiator valves.
FEATURES—These valves were designed with ample capacity to vent radiators quickly. The manufacturer states that the internal construction provides liberal clearances which will prevent dirt from clogging and interfering with the valve action. An important constructional feature is provided in the crimped base construction which is said to be leak proof. The shells of the valves are streamlined to give them a modern appearance and they are nickel plate. The valves are positive in operation and non-adjustable. Valve illustrated is the No. 40 angle pattern.
TYPES AND SIZES—No. 40 angle pattern, size ⅛ in. No. 41 straight shank, ⅛ in. No. 43 straight shank, ¼ in. No. 45 straight shank basement vent, ⅜ in. female, ¾ in. male.
MADE BY—*Hoffman Specialty Co., Inc., Waterbury, Conn.* *34*

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Birmingham, Ala.–Hilton Smith, 307 N. 23rd
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Cleveland, Ohio–C. E. Noel, 1836 Euclid Ave.
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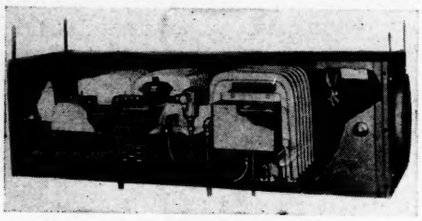
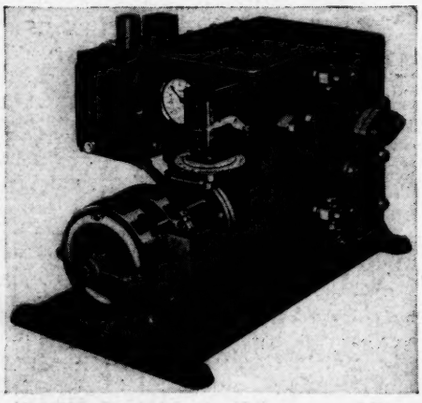


Bryant Gas Humidifier

NAME—Bryant gas humidifier.
PURPOSE—Gas-fired humidifier for residential installations.
FEATURES—Air entering the unit passes between raised portions of cast iron heating section, inside of which hot flue gases are circulated. This preheated air then passes through a battery of porous refractory plates, the lower ends of which are immersed in a porcelain finished water pan. The warmed humidified air is then carried through a duct to the house. The flue gases after leaving the heating section pass around and below the water pan to the outlet located at the left rear corner of the humidifier. The water is maintained at proper level by an automatic float tank. During off periods of the humidifier a bypass in the thermostatic gas valve reduces the burner consumption to 3000 B.t.u. per hr., which is said to be sufficient to maintain the proper water temperature and retain heat in the air section. Equipment is enclosed in a metal jacket which has a convenient access panel on the side.
SIZES AND CAPACITIES—Evaporating capacity of 15 gal. per day with a gas input of 20,000 B.t.u. per hr. and air capacity of 200 c.f m.
MADE BY—*The Bryant Heater Co., Cleveland*.....*35*

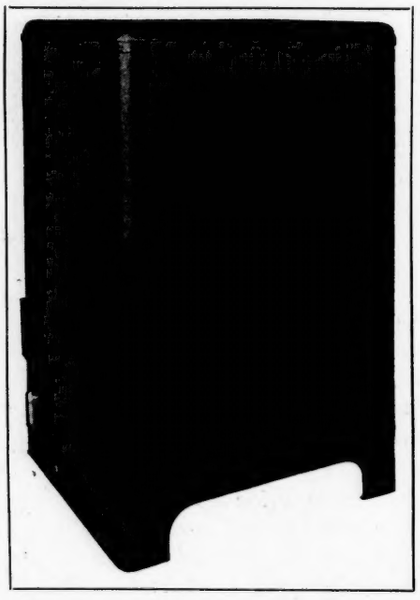
Sterling Vacuum Pump

NAME AND MODEL NUMBER—Sterling vacuum pump, type S.
PURPOSE—For producing vacuum on the returns of heating systems and delivering condensate to the boiler.
FEATURES—Outstanding features of this pump are: (1) Its compactness; (2) all piping and working parts are enclosed inside of a cast iron receiver; (3) an entirely new pilot-operated bellows type discharge valve which is used in the pumping unit for the discharge of the water to the boiler.
SIZES AND CAPACITIES—Sizes from 2500 sq. ft. to 65,000 sq. ft.
LITERATURE AVAILABLE—Bulletin No. 372.
MADE BY—*Sterling Engineering Co., Milwaukee, Wis.*.....*36*

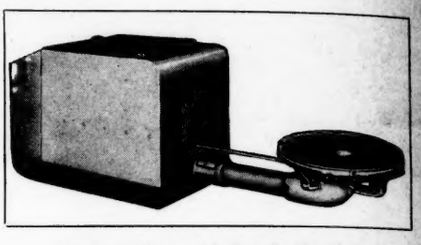


Trane Gas Unit Heaters

NAME—Trane gas unit heaters.
PURPOSE—For supplying warm air to a room using gas as a fuel.
FEATURES—These unit heaters are available in both the suspended types and floor types. The operation is automatic once the pilot has been turned on. The thermostat which controls the operation may be installed in any remote position. A Trane coordinated safety control which is a combination gas pressure regulator, automatic main gas valve, safety pilot control, high temperature cut-off, and reset mechanism is provided. The heat exchanger and generator are made of non-ferrous



metal, die formed. All controls and other mechanical parts are completely enclosed in an attractive cabinet made of high-grade furniture steel finished in tapestry crackle brown enamel. An air circulation control switch shuts the gas valve if the fan stops operating.
SIZES AND CAPACITIES—Made in either suspended type or floor type. Three models of each with capacities from 45,000 to 85,000 B.t.u. per hr. input.
LITERATURE AVAILABLE—Bulletin 321.
MADE BY—*The Trane Co., La Crosse, Wis*.....*37*

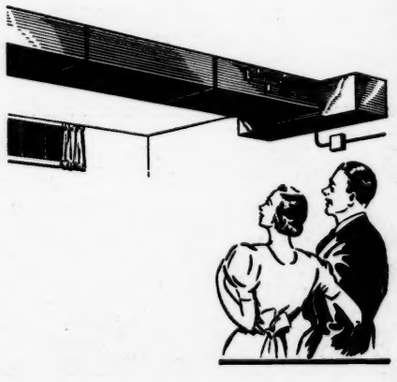


Meier Natural Draft Stoker

NAME—Meier natural draft stoker.
PURPOSE—For automatically burning stoker size fuels with natural draft.
FEATURES—Stoker operates entirely on a natural draft principle, eliminating the usual fan or blower. The manufacturer states that this eliminates the clinker and fly ash problem. Grates are automatically revolved to keep the fuel bed agitated and to provide a fire burning over the entire grate area. The grates are kept clean by the revolving action which sifts the ashes into receivers placed in the ash pit. The draft is automatically controlled.
MADE BY—*Meier Electric & Machine Co., Indianapolis, Ind.*.....*38*

Gasconaire Gas Furnace

NAME—Gasconaire overhead gas furnace.
PURPOSE—A gas fired warm air furnace for installation on the basement ceiling.
FEATURES—Furnace is designed to be suspended overhead in the basement. Its top is insulated with one inch of air cell insulation to prevent heating of the basement ceiling. Two filters are employed for air cleaning and a double blower is used for moving the air. The gas is burned in a dual-chamber gas burner and the air is heated by passing it over a long horizontal heat radiating surface. A small vent pipe and draft blower are used to carry off the flue gases. An automatic humidifier is used to humidify the air. Electric ignition is provided on the gas burner. Controls provided include an automatic gas valve, pressure regulator, summer switch, blower and limit control and a 2 speed blower control.
MADE BY—*Gasconaire, Inc., Detroit, Mich.*.....*39*



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End your steam trap troubles with Yarway. Ask your dealer or write for Catalog T-1734.

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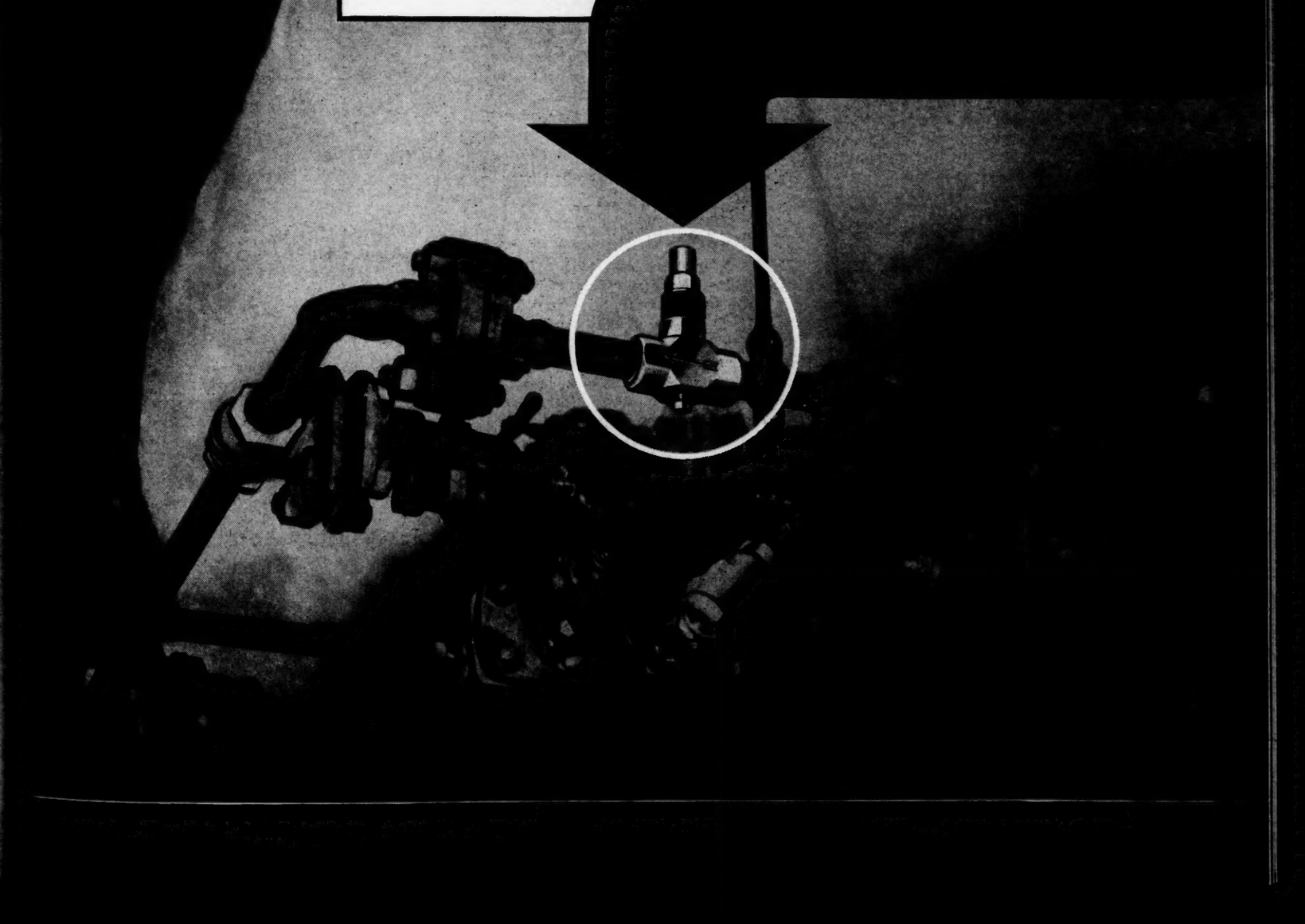


Cruikshank Stokerless Boiler

NAME AND MODEL NUMBER—Imp stokerless boiler, Models 720 and 723.
PURPOSE—For generating steam and hot water using buckwheat and rice sizes of anthracite.

FEATURES — Boiler consists of a water-jacketed funnel shaped coal magazine or hopper having its spout directly over the rotating grate. A section of the spout is cut away and the periphery has a spiral shape terminating in a heel. As the grate rotates fresh coal feeds through the slot and the entire fuel bed is pushed outward due to the shape of the stationary spout. The ash is discharged from the edge of the grate and falls into cans placed in the base of the boiler. Boiler is of welded steel construction and consists of three horizontal pieces concentric with the burner. The mechanism may readily be removed and replaced as a unit, including the entire retort. The coal feed is controlled by the rotational speed of the grate, which may be varied by means of a gear of special shape which meshes with any one of a number of concentric gears cast in the face of a rotating plate on the drive shaft.
SIZES AND CAPACITIES—Six sizes with capacities ranging from 700 to 2250 sq. ft. E.D.R. hot water and from 420 to 1350 sq. ft. E.D.R. steam.
MADE BY—*The V. M. Cruikshank Utilities, Sunbury, Pa.* *40*

Wayne Coal Stokers

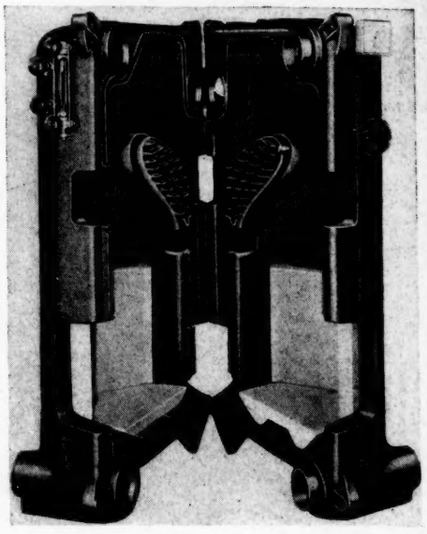
NAME AND MODEL NUMBER—Wayne home heating stoker, Nos. W-25 and W-35.
PURPOSE—For automatic firing of coal.
FEATURES—The tuyeres are cast in small segments, located around a rectangular retort and are said to provide an extremely short air travel. The manufacturer states that power is greatly reduced by this feature. Feed worm is made of nickel chrome steel.
SIZES AND CAPACITIES—Made in two sizes with coal handling capacities of 25 and 35 lb. per hr.
MADE BY—*Wayne Oil Burner Corp., Fort Wayne, Ind.* *41*

Surface Combustion Conditioner

NAME AND MODEL NUMBER—Janitrol winter air conditioner, models BCH90-83 and BCV90-83.
PURPOSE—For supplying warm, circulated, clean and humidified air.
FEATURES—The ECV is a vertical model designed especially for installations where the floor space is at a premium. It occupies a space of 22 in. wide by 25½ in. deep. The height is 74 in. The BCH, a horizontal model, is 52 in. high, making it suitable for basements with low ceiling heights. Floor space required—22 in. wide by 50½ in. deep. Specifications include two heavy steel plate corrugated heat exchangers; grey cast iron burners with raised ports; insulated cabinet; automatic safety pilot; and standard controls, including electric solenoid gas valve, relay, acratherm, limit control and adjustable gas pressure regulator.
SIZES AND CAPACITIES—Each model is available in one size with a capacity of 90,000 B.t.u. per hr. intake.
MADE BY—*Surface Combustion Corp., Toledo, Ohio.* *42*

Smith Oil-Burning Boiler

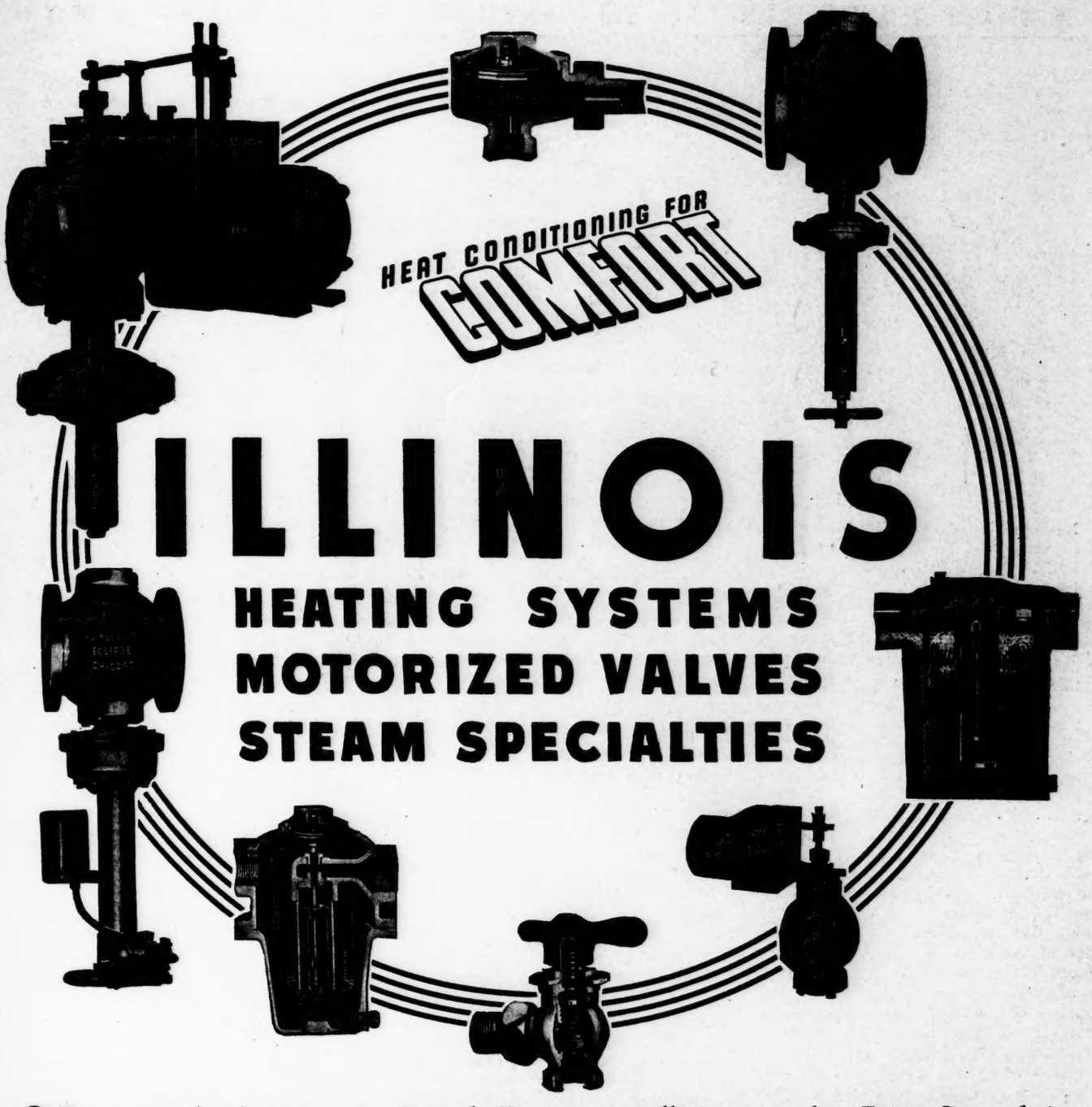
NAME—Five Star oil-burning boiler.
PURPOSE—For supplying steam or hot water utilizing oil as a fuel.
FEATURES—The boiler consists of two large castings and a few miscellaneous parts. A special ceramic firepot locks in without cement. The flue gases pass up and over the overhanging crown sheet which absorbs heat both directly from the burning fuel and from the hot fuel gases. After passing over this crown sheet the hot flue gases travel through a down travel flue and out through an opening in the lower rear of the boiler. Some of the gases are carried down from the combustion chamber, down the sides and underneath so as to quickly heat the firepot and increase efficiency. A small swing door between the firepot and the down-travel flue operates when the burner comes on in order to provide smooth and quiet operation and to even out firepot draft. A large relief door in back of the boiler offers protection against temporary burner failure. This door opens quickly when necessary and closes automatically. Provision is made for either a built-in low-water cut-off or for a water feeder. Two methods of supplying domestic hot water are available, either a tankless heater consisting of two large cop-



per tubes or a tank heater consisting of a small copper tube.
SIZES AND CAPACITIES—Available in four sizes with steam ratings of 410 to 530 sq. ft.
MADE BY—*The H. B. Smith Co., Westfield, Mass.* *43*

Healy-Ruff Condensate Return System

NAME—Whitson automatic condensation return and boiler feed system.
PURPOSE—For returning condensation to boilers.
FEATURES—The manufacturer states that this system removes condensation as rapidly as it is formed and returns it to the boiler at high temperatures. When the unit is operating and the tank fills with water, the float switch in the tank automatically starts the motor which in turn opens the steam valve and closes the relief valve. A cam-actuated two circuit mercury switch automatically stops the motor when it has completed this operation. Steam then enters the tank and equalizes the pressure in the tank and the boiler. This causes the water to flow into the boiler by gravity. When the tank is empty the motor automatically closes the steam valve and opens the relief valve, venting the trap. This allows the condensation to flow into the tank. When the tank is again filled, the cycle is repeated.
SIZES AND CAPACITIES — Made in six sizes with capacities ranging from 1200 to 16,000 lb. of water per hr. or from 2300 to 40,000 sq. ft. of direct radiator surface.
MADE BY—*Healy-Ruff Co., St. Paul, Minn.* *44*



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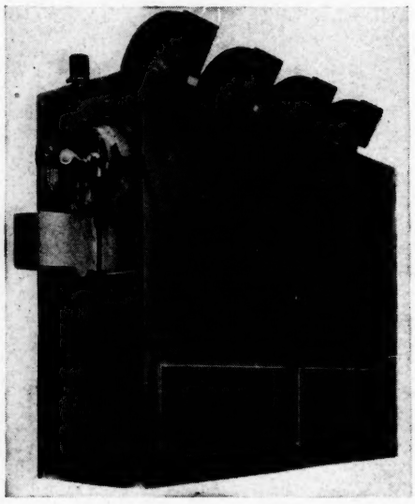
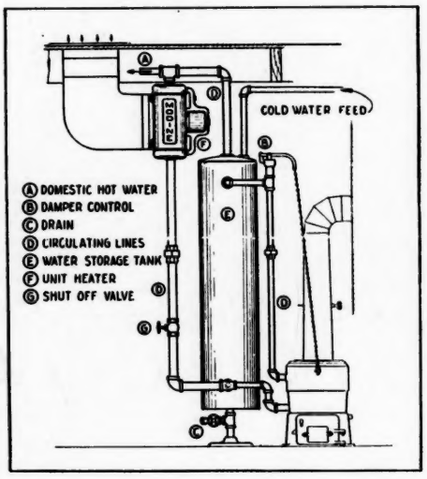


Surface Combustion Unit Heater

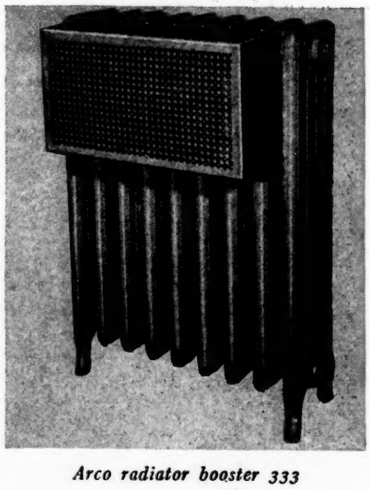
NAME AND MODEL NUMBER—Large capacity unit heater, No. F1250SC.
PURPOSE—A unit heater for heating industrial buildings with large ceilings. Uses either manufactured, natural, Butane or Propane gas as a fuel.
FEATURES—Unit is of the floor type design 3 ft. in width and 10 ft. 9 in. in length. This small width is said to make it practical to install the heater next to the wall or between columns without taking up any large amount of productive floor space. Unit is 8 ft. 3 in. high and weighs 5200 lb. With the exception of the controls, the unit is shipped completely assembled. Four air outlets, each with horizontal louvers of the adjustable type are provided. Each outlet can be rotated throughout a complete circle permitting discharge of the air in any desired direction. If desired, ductwork may be attached to the outlet. Air is circulated by two fans and a third fan is provided for delivering air to the burner. All fans are driven by a single 7½ hp. motor.
CAPACITY—Input capacity 1,250,000 B.t.u. per hr., output of 1,000,000 B.t.u. per hr.; air delivery 10,000 c.f.m. with an average temperature rise of 125F; air velocity 2500 f.p.m.
LITERATURE AVAILABLE—Bulletin UHF-83.
MADE BY—*Surface Combustion Corp., Toledo, Ohio.* 45

Modine Supplementary Unit Heating System

NAME—Modine system of supplementary house heating.
PURPOSE—For supplementing the operation of the house heating system during spring and fall days or during cold weather.
FEATURES—Briefly, this system consists of a hot water type Modine unit heater connected by a short supply duct to the room to be heated. The unit heater is supplied with hot water from



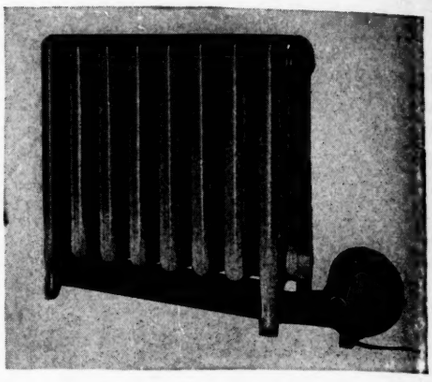
a domestic hot water storage tank which obtains its hot water from a bucket-a-day type tank heater. The fan of the unit heater forces air through the heating element, resulting in a high rate of heat transfer from the hot water to the air. The warm air is delivered from the unit through the supply duct into the area to be heated. Operation of the unit heater may be controlled manually or thermostatically.
SIZES AND CAPACITIES — Seven sizes with free air delivery capacities ranging from 7,500 to 81,000 B.t.u. per hr. and 1/8 in. static resistance capacities ranging from 12,780 to 47,800 B.t.u. per hr. Above capacities obtained with 145F water.
LITERATURE AVAILABLE—Anthracite Industries Laboratory Bulletin No. 33.
MADE BY—*Modine Manufacturing Co., Racine, Wis.* 46



Arco radiator booster 333

Arco Radiator Booster

NAME AND MODEL NUMBER—Arco radiator booster Nos. 333 and 334.
PURPOSE—For increasing the capacity of radiators.
FEATURES—The first model consists of two propeller-type fans mounted in



Arco radiator booster 334

an ivory enameled jacket and designed to draw air through the grille and discharge it through the radiator. Unit is attached to tube-type radiators by means of brackets which hook over the top of the radiator. A switch mounted on the side of the unit controls the operation. Model 334 is designed to fit under tube-type radiators which have a 3-in. clearance from the floor. It consists of a small motor-driven blower, the discharge of which is attached to a distribution tube. This tube is placed under the radiator and when the blower is in operation air is blown upward through the radiator. Either of these units is said to be capable of increasing the output of a radiator as much as 100%, depending on the size of the radiator.
MADE BY—*American Radiator Co., New York.* 47

Pierce-Butler Boiler

NAME—Pierce-Century boiler.
PURPOSE—For supplying steam or hot water using coal or oil.
FEATURES—This boiler is manufactured in one size only to heat an average small house. Two unit castings and a base make up the boiler proper. There is a four-way flue gas passage with no fins to collect soot or fly-ash. Three grates are employed and all couplings and shaking connections are outside of the ashpit. By removing the front plate of the base, a stoker-fired retort can be installed in the high ashpit. Boiler is shipped with both sections and the front doors completely assembled and puttied. On the oil-fired model the boiler door is tightly sealed by safety lock latches. The sight glass in this door makes possible the inspection of the combustion chamber at all times. Submerged heating coils are used to supply domestic hot water.
SIZES AND CAPACITIES—Boiler made in one size for either coal or oil. Coal rating, 350 sq. ft. installed radiator surface; oil rating, 350 sq. ft.
MADE BY—*Pierce-Butler Radiator Corp., Syracuse, N. Y.* 48

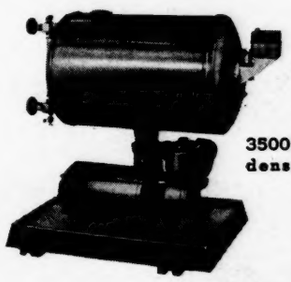
★3800 SERIES

CONDENSATION PUMP

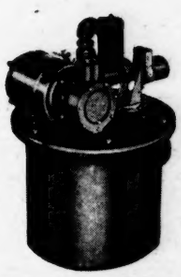
A STANDARDIZED UNIT

★ OUTSTANDING FEATURES

1. Cast iron receiver.
2. Only one moving part.
3. Bronze fitted pump.
4. No metal to metal contacts.
5. Ball bearing construction.
6. Quiet operation.
7. Capacities 1000 to 5000 E. D. R.
8. One size one price.
9. ¼ Horse power motor.
10. Low cost.



3500 Series Condensation Pump.

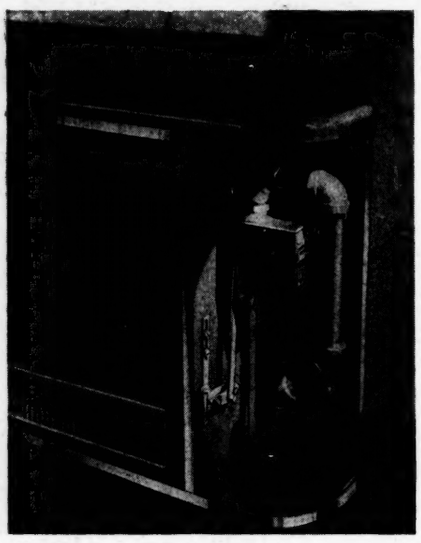


3700 Series Underground Condensation Pump.

Type S Duplex Vacuum Pump.

A complete service in pumping units for heating requirements.
Write for Bulletins 384-Condensation Pumps, 372-Vacuum Pumps.

STERLING ENGINEERING CO. 3732 N. Holton St. MILWAUKEE, WIS.



Barber-Colman Unit Ventilator Controller

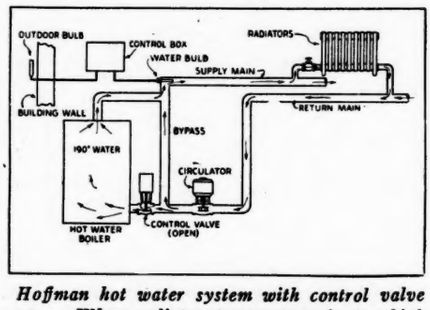
NAME—Microventrol.
PURPOSE—A combination valve and damper controller for use with unit ventilators.
FEATURES—This unit gives full proportioning to any of the conventional or special cycles adopted by unit ventilator manufacturers. The operator of this unit is mounted on the valve and controls the steam supply directly through a cam and plunger mechanism. The extended power shaft of the motor is connected through a linkage to the damper of the unit and is adjustable to accomplish variable minimum air requirements on the damper as well as all the operating cycles specified. The Microventrol incorporates the Barber-Colman shaded pole, reversing motor, and operates with the potential dividing rheostat to balance the solenoid in any Micro controlling instruments.
MADE BY—*Barber-Colman Co., Rockford, Ill.* *49*

Crane Convector Grille

NAME—Convector enclosure with Plaskon grille.
PURPOSE — Improved appearance, greater adaptability.
FEATURES — Rounded corners, modern styling, sectional, streamlined grille.
SIZES AND CAPACITIES—Wide variety to meet all conditions.
MADE BY—*Crane Co., Chicago, Ill..50*

Hoffman Hot Water Heating System

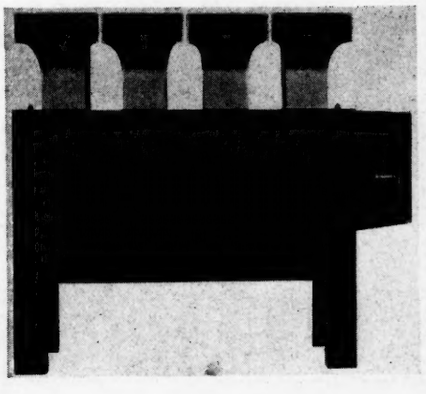
NAME—Hoffman hot water controlled heating system.
PURPOSE — A specially controlled forced hot water heating system for buildings.
FEATURES—The manufacturer states that this system will successfully maintain a uniform room temperature under all conditions. The basic principles of this system are: (1) continuous circulation of the water in the system; (2) the boiler is bypassed from the rest of the circulating system; and (3) temperature control based on a balanced condition between outdoor and radiator temperatures. The system consists of the regular boiler, supply and return mains, radiators or convectors, expansion tank and relief valve, and a Hoffman circulating pump, control valve and a temperature controller with outdoor and water temperature bulbs. In operation, the boiler is maintained at a constant temperature in accordance with the desired heat emission. The pump runs continuously except when the outdoor temperature rises to about 65F. The piping differs from the conventional layout in that a bypass and a Hoffman control valve are installed between the pump and the boiler. Unless the control valve is open, the water circulating continuously through the piping and radiators does not pass though the boiler. Water circulating through the pipes and radiators is automatically held to the temperature which offsets the heat loss of the building at any given outdoor temperature. For example, if outdoor temperature is 40F, the water circulating through the radiators of a system designed for 10F below zero will be 118F. This control is accomplished by the water temperature bulb installed in the supply main close to the boiler. When the water in the circulating system drops below 118F, the water bulb sends a call for heat to the Hoffman temperature controller. This temperature controller in turn causes the control valve to open, admitting hot water from the boiler into the circulating system. When the outdoor temperature changes the outdoor bulb goes into action. If the temperature falls, the outdoor bulb causes the temperature controller to maintain a higher water temperature. When the outdoor temperature rises, the temperature controller maintains a lower water temperature. The manufacturer states that radiators cannot heat up during summer operation when the boiler is kept operating to supply domestic hot water because of the control valve in the return main and the drop design of the supply main.
MADE BY—*Hoffman Specialty Co., Inc., Waterbury, Conn.* *51*



Hoffman hot water system with control valve open. When radiator temperature is too high control valve closes and bypasses water around boiler.

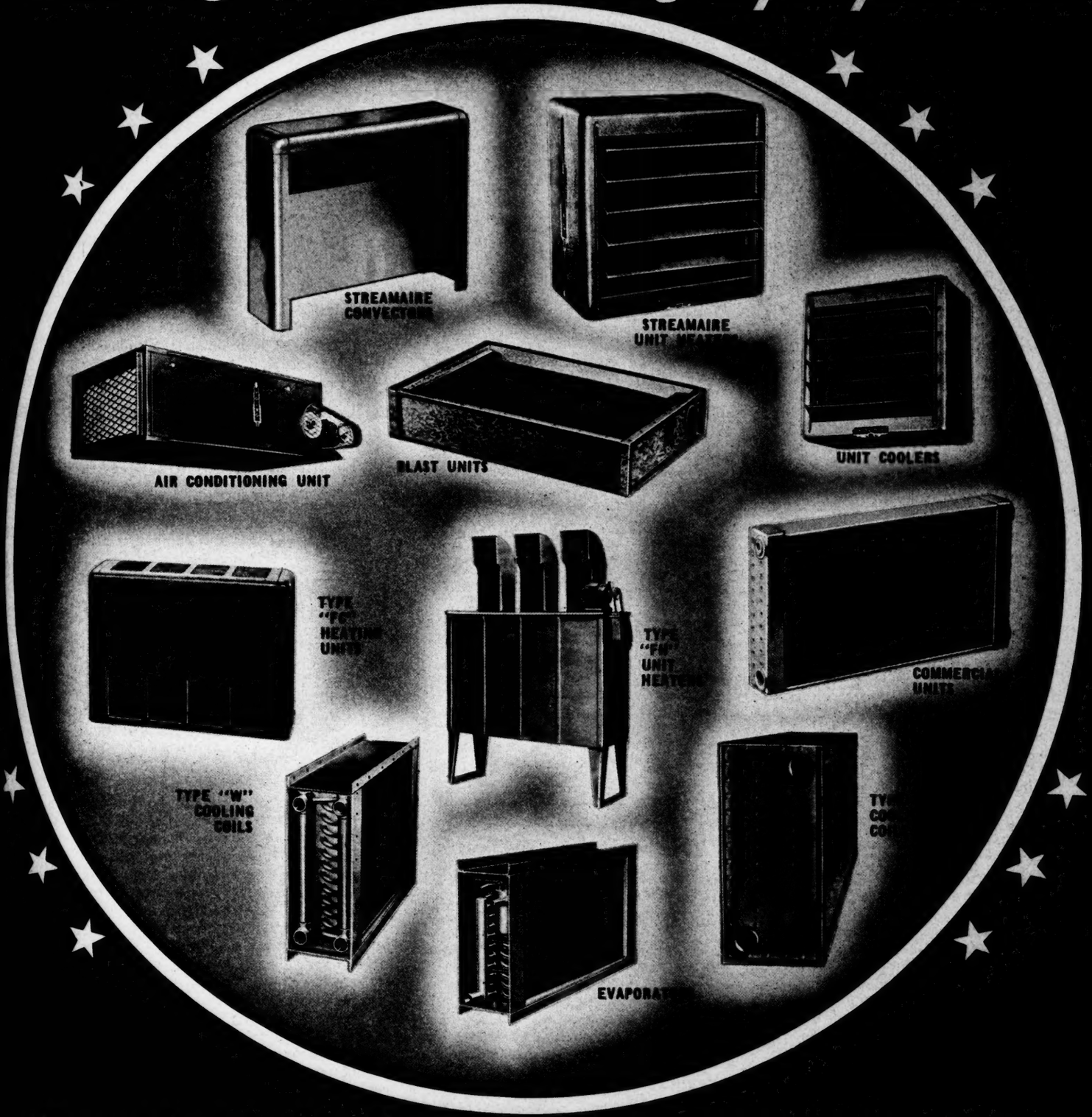
American Blower Unit Heater

NAME—Sirocco unit heater.
PURPOSE—For space heating in industrial and other large buildings.
FEATURES—These unit heaters are available as V-belt driven or direct driven in four types: an inverted wall type, an upright wall type, a floor type, and ceiling type. Illustration shows the floor model. The outlet cowls are proportioned to give an isoformed air flow, high discharge velocity, and minimum resistance. A square base permits changing the direction of air discharge. All fan housings are die-formed with streamline inlets for high efficiency and noise reduction. The lower front and back panels of the heater are removable for inspection and cleaning of the unit. The convectors used with these units are suitable for operation on steam pressures from 2 lb. to 200 lb. and are constructed with copper tubes and fins and cast brass headers. Convectors are of the return bend type with steam and drip headers on the same end. The main casings of this unit are die-formed and are finished in three colors. Units can be equipped with a Thermadjust feature which includes base and bypass damper to provide a means for bypassing a percentage of the air handled by the fans around the convector. This assembly gives a means of obtaining closer temperature regulation with a constant air supply from the unit. The installation of this device can be made either at the factory or on the job after the unit has been installed.
LITERATURE AVAILABLE—Bulletin A-7018.
MADE BY—*American Blower Corp., Detroit, Mich.* *52*



YOUNG

Heating and Cooling Equipment



Whatever your heating or cooling problems, you will find a practical, economical solution in selecting a YOUNG product. Once you install YOUNG equipment your problem is solved for years to come.

Each unit is available in graduated sizes and capacities to meet any requirements of the architect, heating contractor, or engineer, for use in any type of residential, commercial or industrial building. Over a period of years, YOUNG heat transfer surfaces fully compensate their users for they are built to give constantly efficient service with practically no attention or upkeep expense.

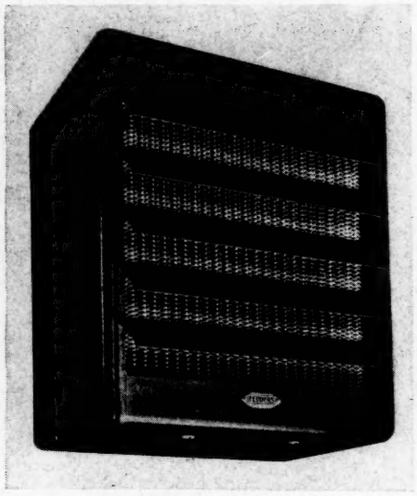
Satisfactory past experience prompts many architects, heating engineers, and contractors to specify YOUNG units for they know that YOUNG design incorporates every modern phase of heat transfer and that the units are light in weight, easy to handle and install, compact and attractive in appearance.

The YOUNG representative in your territory is a competent heating engineer thoroughly versed in the science of heat transfer. He has a knowledge of local conditions and will aid you without cost or obligation.

Write for descriptive literature.

OFFICES IN ALL

YOUNG RADIATOR COMPANY

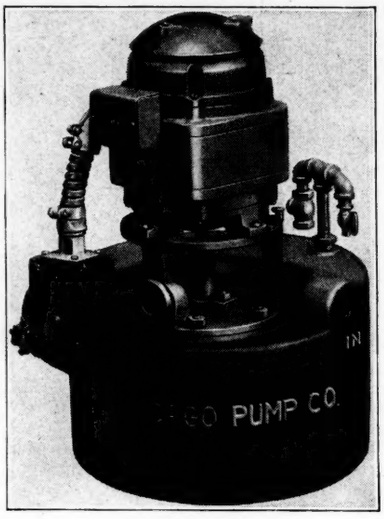


Fedders Unit Heaters

NAME AND MODEL NUMBER—Fedders unit heaters, Series 4.
PURPOSE—For heating air using steam.
FEATURES—Included in the improvements of this line of unit heaters are new cabinets, new heating elements with double headers, new manifolds and improved full floating mountings for eliminating expansion stresses and maintaining alignment between the element and cabinet. Other features include streamline tubes, individual convoluted fins which are designed to prevent expansion stresses between the tubes and fins and between bonding points, as well as between adjacent tubes. Fin surface is designed to reduce dirt and lint accumulation. Quiet operation is claimed because of the mono-piece cabinet rigidity which is combined with a sound-deadening fabric between the casing and fan shroud. Motors are mounted in rubber to isolate vibration. Each motor is said to be tested in a soundproof room for absence of hum and quietness of operation. Motors for all current characteristics are available, including motors for operation under Underwriters' Class 1, Group D explosive conditions. All motors are fully enclosed.
SIZES AND CAPACITIES—25 sizes ranging in capacities from 75 to 1200 sq. ft. equivalent radiator surface.
MADE BY—*Fedders Mfg. Co., Buffalo, N. Y.* *53*

Chicago Condensation Pump

NAME—Chicago condensation pump.
PURPOSE—A small low-cost condensation pump and receiver for heating systems.
FEATURES—The cast iron receiver is small and it is said that it has only a small distance to travel, which the manufacturer states allows the condensation to be returned to the boiler before it has a chance to cool off. The receiver sets on the floor or in a shallow pit with no foundation bolts necessary. Motor is mounted in a vertical position on top of the receiver as a protection against floods. Pump is suspended in the receiver from the motor and the whole assembly, motor and pump, can be lifted out by loosening a few nuts at the top of the receiver. Pump has a bronze casing and rotor and stainless steel shaft. A heavy-duty, enclosed float switch, which is heavy enough to throw the motor



across the line is mounted on the receiver. This float switch is actuated by a seamless copper float inside the receiver.
SIZES—For systems with 500 to 2000 sq. ft. direct radiator surface and 10 to 45 lb. pressure.
MADE BY—*Chicago Pump Co., Chicago, Ill.* *54*

Trane Gas Air Conditioner

NAME—Trane gas air conditioner.
PURPOSE—Gas-fired unit for winter or year-round air conditioning.
FEATURES—Gas-fired air conditioner serves the winter season with heating, humidifying, filtering and ventilating. An adjustable cascade humidifier and glass wool filters are provided. The unit is so constructed that a cooling section for summer air conditioning may be added later. This cooling section is made up of a Trane coil, plus the necessary connections. The air conditioning unit is self-contained and factory-assembled and all mechanical parts, including controls, are completely enclosed in a cabinet. Casing is fabricated of high-grade furniture steel finished in tapestry brown crinkle enamel. Unit is available for either floor or ceiling mounting. Connections required consist of gas and water pipes and electric connection. It is automat-

ically controlled and once the pilot has been lighted the thermostat automatically takes care of the operation during the rest of the winter. Other controls provided include a safety control which is a combination gas pressure regulator, automatic main valve, safety pilot control, high temperature cut-off and reset mechanism; a sail switch which automatically shuts off the gas supply on the obstruction of the air outlet of the unit to prevent overheating; and a special summer-winter switch.
LITERATURE AVAILABLE—Bulletin No. S-320-1.
SIZES AND CAPACITIES—Available in either floor or suspended types, three models of each, capacities from 90,000 to 180,000 B.t.u. input.
MADE BY—*The Trane Co., La Crosse, Wis.* *55*

G-E Conversion Oil Burner

NAME—G-E oil burner.
PURPOSE—For converting boilers and furnaces for oil burning.
FEATURES—This burner operates at from 8 to 15 lb. pressure and utilizes compressed air for atomization of the oil. Because of this the manufacturer states that a large orifice can be used, thus reducing the chances of clogging with dirt and carbon. A high-pressure fan is used on the burner to minimize the effect of draft variation. A vane-type oil pump is used and is said to be capable of drawing oil from tanks as far as 15 ft. below the burner. The motor compressor unit and controls on this burner are the same as those used on the G-E furnace. A gray metal jacket encloses all parts and wiring of the burner. The unit is said to burn No. 2, 3, or 4 fuel and the oil flow is kept at a constant rate by a stabilizer regardless of the viscosities of the various grades of oil.
SIZES AND CAPACITIES—Available for oil rates of ¾ to 3 gal. per hr.
MADE BY—*General Electric Co., Bloomfield, N. J.* *56*

ADSCO PRODUCTS
FOR STEAM DISTRIBUTION

24" 300 lbs. ADSCO Double Type Piston-Ring Expansion Joint, 8" Traverse per slip, with beveled ends for welding, purchased recently by a large Eastern public utility company.

Send for Catalog describing complete **ADSCO LINE** *including:*

- Expansion Joints
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AN EXPANSION JOINT FOR EVERY PIPING NEED

From Small Riser Joints to Semi-Steel or Cast Steel Joints for High Pressures and Temperatures

A pipe expansion and contraction problem? Consult the ADSCO Catalog No. 35 FIRST! That's what hundreds of consulting engineers, heating contractors and plant engineers do. They know from experience that from the complete ADSCO line they can select the correct type of dependable expansion joint to suit their requirements.

Furthermore, they know that from the same reference book they can obtain important data on steam line accessory equipment to plan or install an underground or surface steam line.

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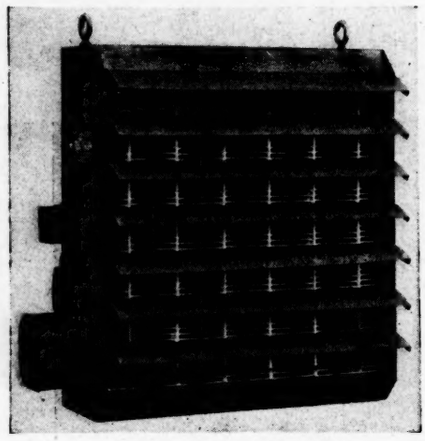
TILE CONDUIT FOR UNDERGROUND STEAM LINES

ADSCO-Bannon Tile Conduit, Cast-Iron Conduit and "Fibreglass Insulation" are making new friends for ADSCO daily. They are dependable products, sold at a reasonable price to give years of efficient service in underground steam line installations. Fully described in Bulletin No. 35-67A in the ADSCO Catalog No. 35.

ROTARY CONDENSATION METER

The ADSCO Rotary Condensation Meter is standard equipment on the lines of many district heating companies, colleges, institutions and industrial plants for metering the steam as condensate to determine heating costs. Available in 7 sizes from 250-12000 lbs. per hour capacity. Low in cost per unit of capacity.

AMERICAN DISTRICT STEAM COMPANY
NORTH TONAWANDA, N.Y.
IN BUSINESS OVER SIXTY YEARS

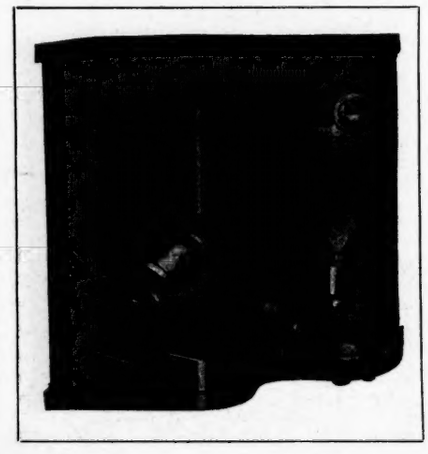


Electric Unit Heaters

NAME—Electromode standard industrial heaters.
PURPOSE—For supplying warm air, using electricity as a heat source.
FEATURES—Heating grid is made of aluminum cast on the tubular heating element. The manufacturer states that a cast-in construction seals the heating element, preventing oxidation and deterioration. It is also claimed that the aluminum fins permit low temperature operation. The unit consists of these aluminum grids, a four-blade aluminum propeller fan, a totally-enclosed motor, adjustable louvers for directing the heated air, a cabinet built of heavy lead coated steel and aluminum castings, and a safety switch which automatically disconnects the heater in case the fan is overheated, and a standard terminal box.
SIZES AND CAPACITIES—Ten sizes with capacities ranging from 34,150 to 614,700 B.t.u. per hr.
MADE BY—*Electric Air Heater Co., Div. of American Foundry Equipment Co., Mishawaka, Ind.* 57

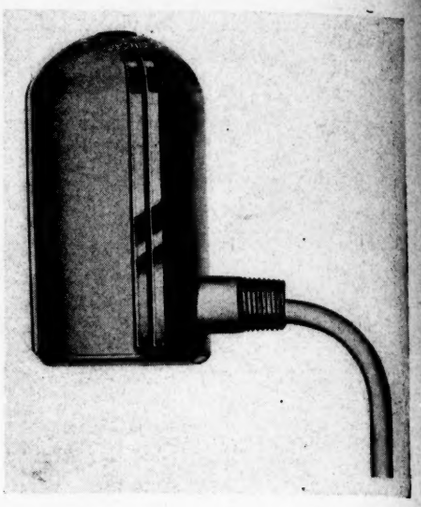
Arco Thermo Humidifier

NAME AND MODEL NUMBER—Arco thermo humidifier No. 7000.
PURPOSE—For supplying up to 4 gal. of moisture to the air per day.
FEATURES—This device is made of heavy brass and is mounted with a dustproof electric motor and blower. The air is transmitted by the blower through the humidifier which contains a self-cleaning vaporizing nozzle. From the humidifier the air is carried by means of ducts to an outlet grille in a central room of the residence. A water supply line is connected to the humidifier and the flow of water is controlled by an electric valve. This valve can either be controlled by room humidistat or by a manually-operated switch. An Arco Thermo humidifier interrupter can be supplied with this device to prevent over-humidification in cold weather. This control has been adjusted so that the humidifier is automatically shut off when the outside temperature drops below 15F.
MADE BY—*American Radiator Co., New York.* 58



Marsh Automatic Air Valve

NAME AND MODEL NUMBER—Marsh adjustable venting automatic air valve, No. 73.
PURPOSE—For controlling the rate of air venting from steam radiators and for preventing the escape of steam.
FEATURES—Valve has a double shell construction. Air is vented into the compartment formed by this shell where it expands and leaves noiselessly through seven small vents in the radiator side of the outer shell. It is said that by substituting seven ports for the usual single port, all noise is eliminated. A large float chamber is included to provide plenty of space for air and water separation and to stop float bobbing and spitting. The manufacturer states that the syphon pipe will fit into the narrowest radiator and that any venting rate up to the capacity of a valve is obtained by merely turning the indicating screw on the top. Body is finished in satin aluminum with ribs polished.
SIZES AND CAPACITIES—⅛ in. angle pattern, ⅛ or ¼ in. straight pattern, ¾ in. male straight pattern with ⅜ in. female tapping in connection.



MADE BY—*Jas. P. Marsh Corp., Chicago, Ill.* 59

Spencer Automatic Warm Air Furnace

NAME—Spencer automatic warm air furnace.
PURPOSE—For supplying warm air using coal as a fuel.
FEATURES—Coal is placed in a hopper or magazine from which the fuel feeds by gravity to the fire bed. The manufacturer states that there are no moving parts to get out of order and the unit is designed to burn No. 1 buckwheat anthracite. Furnace is made of cast iron with no caulking beween the sections. It is said that this furnace can be easily converted to oil or gas. Standard equipment includes an automatic overload cut-off regulator, check, turn and ashpit damper. Also shaker lever, poker and hoe. An automatic pan type humidifier with outside copper float chamber is available at extra charge.
SIZES AND CAPACITIES—Seven sizes with capacities ranging from 66,000 to 198,000 B.t.u. at furnace.
MADE BY—*Spencer Heater Div., Lycoming Mfg. Co., Williamsport, Pa...60*

TO OBTAIN FURTHER INFORMATION ON 1938 NEW EQUIPMENT FOR WINTER USE

On the list below circle the item number of the equipment in which you are interested, using the number found at the end of each item.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60

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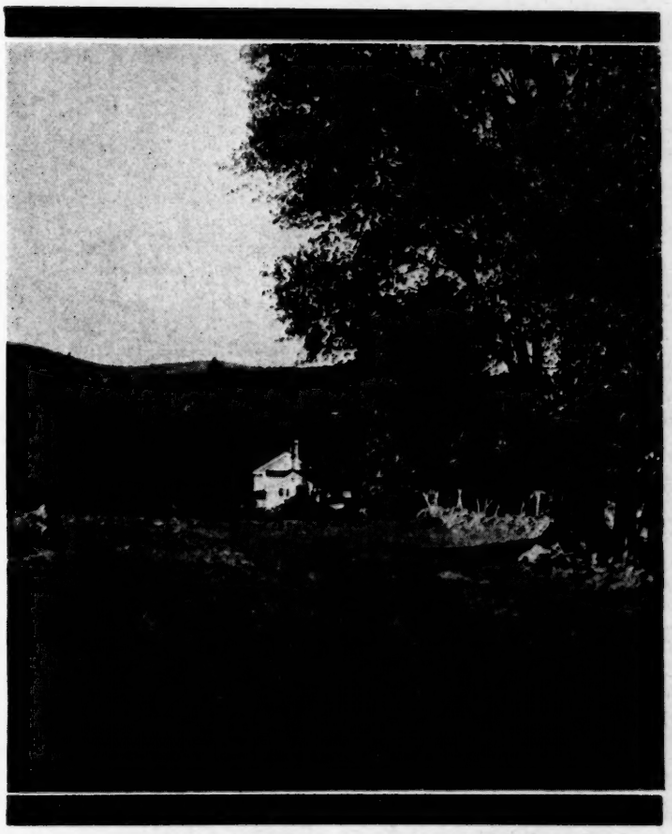
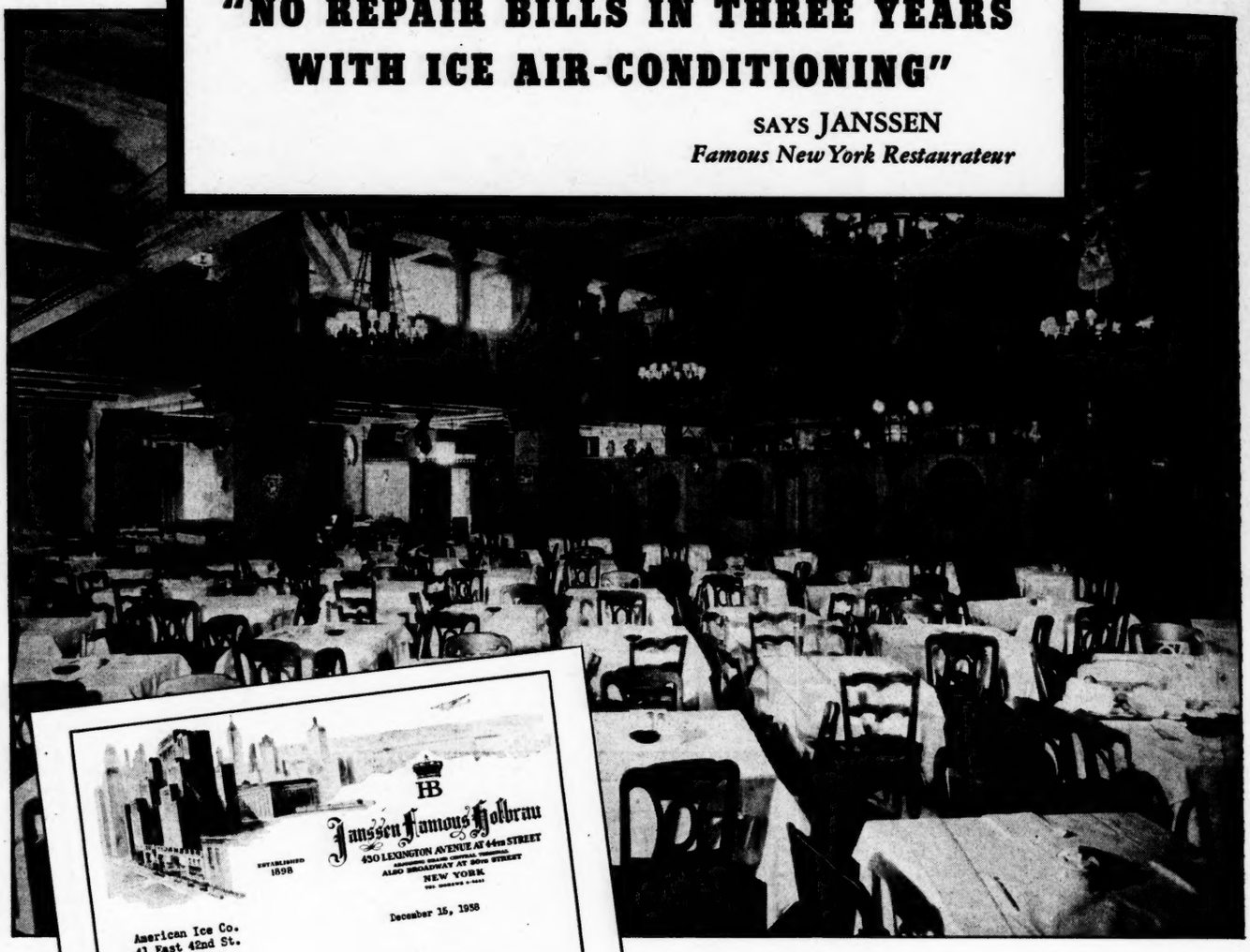


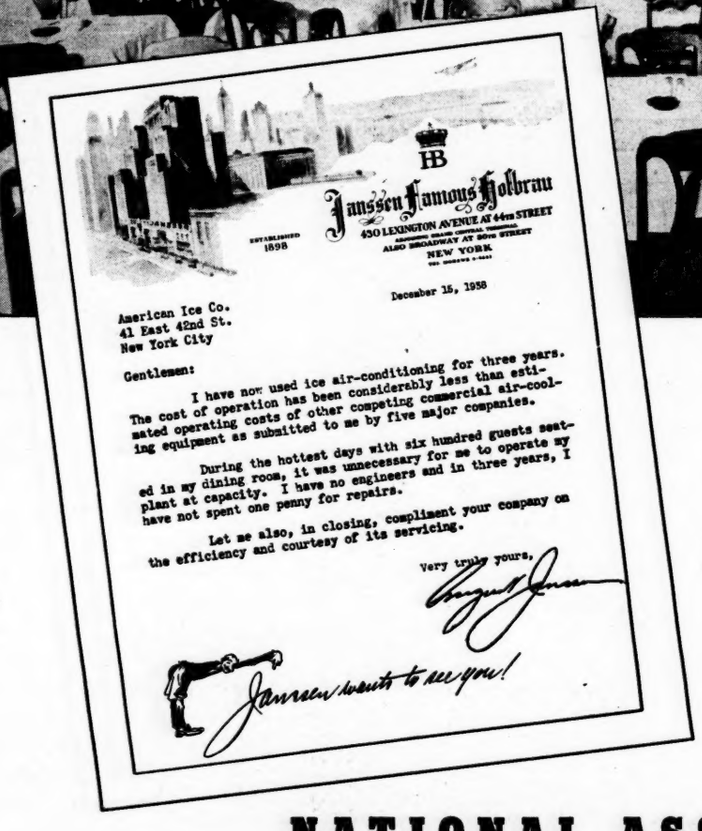
SUMMER SECTION

Pages 66 to 87

"NO REPAIR BILLS IN THREE YEARS WITH ICE AIR-CONDITIONING"

SAYS JANSSEN
Famous New York Restaurateur





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Janssen Famous Hofbrau
ESTABLISHED 1898
430 LEXINGTON AVENUE AT 44th STREET
ALSO BROADWAY AT 52nd STREET
NEW YORK

December 15, 1938

American Ice Co.
41 East 42nd St.
New York City

Gentlemen:

I have now used ice air-conditioning for three years. The cost of operation has been considerably less than estimated operating costs of other competing commercial air-cooling equipment as submitted to me by five major companies.

During the hottest days with six hundred guests seated in my dining room, it was unnecessary for me to operate my plant at capacity. I have no engineers and in three years, I have not spent one penny for repairs.

Let me also, in closing, compliment your company on the efficiency and courtesy of its servicing.

Very truly yours,

Janssen wants to see you!

For practically any establishment where cooling is required on less than a 24-hour basis, you can recommend air-conditioning with ice. Initial cost averages less than half that of other types. Operating cost is very low. Cooling is quick, efficient, dependable. For further information, consult your local ice company or write the Technical Department of the National Association of Ice Industries.

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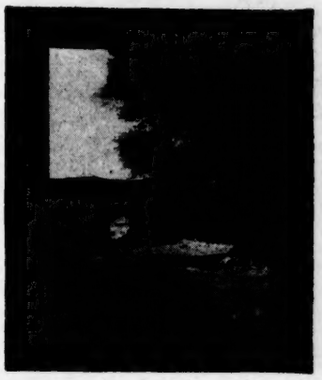


Summer

AS in previous years the point of view adopted in preparing this section is that a summer plant consists of one capable of cooling or dehumidifying, or both. While there was a reduction of 40% in the dollar volume of equipment sold for air cooling purposes in 1938 compared to 1937, there was no diminution in technical interest. Consequently, it has been necessary in preparing this summary to exclude some topics because of lack of space, for to even touch on all that happened in 1938 would be utterly impossible.

An attempt has been made to present those topics which, while perhaps not of most immediate importance during 1938, do act as straws to show the way the wind is blowing. Extension of the size range of self-contained units on the market bids fair to simplify the refrigeration installation and service problem. Storage of refrigeration, the anticipated rise of the absorption cycle of refrigeration to new usefulness, the extremely slow rate of progress in attempting to popularize air cooling for non-profit motives, the continued importance of the present market in commercial buildings, and the improvements being made in chemical dehumidification methods and equipment are all subjects which were of interest during 1938.

Perhaps no recent year has served to bring out more clearly the fact that anyone who wants to keep his thinking about summer air conditioning on a reasonable basis should now preserve an open mind about methods, equipment, application, future markets, future costs, and like subjects. The possibilities have not all been explored, operating results are not yet fully evaluated, local circumstances are diversified from city to city, there is such a wealth of equipment and methods to choose from that any other attitude at the present stage of development is foolhardy.

Hospital Cooling

Certain hospital rooms, especially operating rooms and nurseries, have been cooled in many hospitals for some time. During 1938 the tendency to show preference for these rooms continued but also a number of hospitals installed conditioning equipment to cool all rooms including wards and private rooms for patients. At least a half dozen such hospital installations are a matter of record while several others were reported as committed to full conditioning and were in process of completion at the year-end or were in the planning stages.

With but few fully cooled hospitals, and with most of these installations made but recently, there has been little published information on the results secured. Early in the year (see HEATING & VENTILATING, February, 1938), Dr. Albert G. Young made public certain results observed in the first year's experiences at Corey Hill Hospital in Brookline. He reported generally excellent patient results and also found that the costs of operating the air conditioning equipment were not prohibitive.

Helping to clarify the atmosphere also were the results of a survey among hospital managements reported in "Modern Hospital" in April, 1938. A questionnaire brought replies from 70 hospitals and showed that operating rooms, nurseries, delivery rooms, and anesthesia rooms accounted for nearly all of the installations. Generally, the managements reported satisfaction with the equipment in use and indicated that patient results were good. The survey indicated that few of the hospitals were making any charge for the air cooling.

Since hospital funds are short and since no great number of new hospitals are under construction the total sales of equipment to hospitals in 1938 was small. The expected wide adoption of cooling in hospitals did not decrease the high degree of interest in the general subject, however. Nearly all the hospital installations are used to some extent as laboratories and the work of evaluating air cooling and conditioning as a tool for treating disease and for promoting recovery following sickness went on throughout the year.

Enough has been done to fix operating room methods and equipment rather definitely. Six to 15 changes of air per hour are usually provided at a temperature of 80F and 55% r.h. Since re-circulation of air is usually used during operations it is important to keep heat from sterilizers and lights at a minimum, or at least to keep this heat out of the general room air by the use of local exhaust if necessary. Sterilization of operating room air by ultraviolet light is progressing toward acceptance. Nurseries are frequently arranged to maintain 75 to 77F with 65% r.h. and enough outside air is used to keep odors down, although preferable practice is complete outside air circulation in order to avoid the possibility of cross-infection.

Filtered air as a means of relieving asthma and hay fever has also shown its worth and it is generally accepted that a low humidity and rather low temperatures are also desirable although probably not essential in many cases. Temperature of 76 to 82F and 30% r.h. have been indicated as satisfactory.

A relatively new phase of air treatment is the use of boxes or cabinets where the temperature of patients can be raised quickly or slowly. Studies in this subject were continued during 1938 but no results of a conclu-

sive or final nature were published. At the year-end there were but few conditioned air heat therapy cabinets in hospitals and those were being used largely for experimental purposes.

Cooling in Apartment Houses

Cooling for the better grade apartment houses made but slow progress during the year. Generally cooling equipment is not being built into the large mass production apartment houses intended for low rentals nor is any provision being made for its future addition. Here and there, however, and especially in the hotter cities, some of the new apartment houses are putting it in. The largest number of such houses definitely a matter of record is in St. Louis where there are 13 having year-round equipment. Some of these have now been in operation for a long enough period to judge results which are locally reported as being satisfactory to owners and tenants. It is of interest to learn also that in St. Louis these cooled apartment houses have exerted an influence on the use of air conditioning in that visitors are said to have been so well pleased that they have decided to have cooling put into their own individual houses. In HEATING & VENTILATING for July, 1938, appeared a description of a Dallas apartment house arranged to use all outside air for cooling but installations of this kind are governed by local consideration and generally the year saw little that was new in method or equipment for apartment house cooling. In spite of the slow rate of progress it is still the belief of many in the industry that the apartment house offers an attractive field..

Cooling in Hotels

There are now few first class hotels which do not provide air cooling somewhere in the building, most frequently in bars or restaurants but occasionally in lobbies, lounges, and guest meeting rooms as well. There are but few hotels where cooling is generally provided from top to bottom, including guest rooms. Moreover, there was but little new hotel construction during 1938. It is noteworthy that several of those built or extensively modernized during the year did put cooling into their guest rooms. Southern hotels, notably some in San Antonio, Dallas, and Fort Worth, are reported as offering air cooling permanently in every room. During 1938 the tendency for hotels to experiment with guest room cooling was marked. Various ones provided cooled rooms in typical locations on different floors, others tried out the use of portable equipment which can be wheeled into the guest rooms as necessary. Generally, the remaining volume market for air cooling equipment in hotels is believed to lie in guest room cooling. While 1938 saw some sales in this field and some experiments made by hotel managements, there was no indication to what extent or how soon guest room cooling is going to be widely accepted. Neither was there any outstanding development in equipment or methods intended specifically for hotel use.

Cooling in Residences

Once more a year passed with the long anticipated market for mechanical cooling in residences failing to materialize. While a few new residences here and there were completely cooled by mechanical refrigeration and while room units find their way into a small number of homes, there was no market of any depth in residences in 1938. Statistics indicate that the rate of growth of this kind of installation is slow. The feeling was strong as ever that some day cooling for residences will be general, but little occurred during 1938 to indicate that the time is in the immediate future. Little novel equipment intended especially for residence cooling appeared during the year. There is much to lead to the conclusion that the best equipment approach to the residence market for mechanical cooling lies through the small compact refrigeration equipment slowly evolving for use in the commercial field and on which the consumer price is slowly being lowered.

There still remains much skepticism as to the necessity for cooling detached residences in the northern and western states. It is significant that up to now nearly all the mechanical cooling in residences is reported as being installed in St. Louis, Kansas City, Cincinnati, Dallas, Fort Worth, and other Texas and Gulf cities. There are few mechanically cooled residences in the Eastern, Middle Atlantic, West Coast and Mountain states. As there is at least as much financial ability to purchase per capita in many of these regions as in those reporting the majority of the installations, it is concludable that the failure to purchase up to this time can not be due to inability and may be due to the feeling that the need for cooling is not pressing enough to justify the purchase.

Attic fan cooling, awnings and insulation are still the only means of alleviating summer heat in a great many new residences—in a far greater number than make use of mechanical cooling, in fact.

Transport Conditioning

No notable changes in the practices or equipment used in cooling steam and diesel railroad cars were reported in 1938. The methods are now well worked out and have been substantially reduced to what approaches standard practice. There is still some question as to the final attitude of the railroads toward ice equipment and whether the ice methods will be adopted as a part of permanent practice. It is generally believed that new passenger cars will be equipped for cooling as a matter of course hereafter. How far conversion of existing passenger equipment will continue is not predictable. Best available estimates indicate that there were between 12,000 and 13,000 cooled passenger cars in use on the railroads at the beginning of 1939.

While there was thus a general tapering off in railroad car cooling during 1938 there was a renewal of interest in bus conditioning. Long distance, high speed bus runs, especially through the hot sections of the west and southwest, have seemed like the best places to inaugurate bus cooling. During the year between 200 and 300 especially designed and constructed cooling units for buses were reported as being sold to bus operating companies. Many of these were put in buses for long runs and were in service in the territory west of Chicago. Features of the special bus cooling units are lightness, compactness, quietness in operation, and full control from the driver's seat. The largest reported fleet installation is described in HEATING &

TABLE 1—SUMMER AIR CONDITIONING EQUIPMENT SALES, 1938 AND 1937
(10 months' figures)

Equipment	1938	1937	Per Cent Change
Self-contained units	$4,993,482	$5,565,621	—10.3%
Non-self-contained units	4,426,423	8,021,498	—45.0
Central comfort systems	5,085,985	9,573,707	—46.8
Central industrial systems	643,922	766,273	—16.0
Air washers	393,179	874,678	—55.0
Refrigerating medium	1,190,965	2,916,129	—59.1
Total	$16,733,956	$27,717,906	—39.6%

Ventilating, May, 1938, page 39. Generally, the unit is demountable for repair or service or for removal from the bus during periods when it is not needed. The unit is self-powered generally from a gasoline engine mounted in the same frame as is the compressor and the condenser. Recirculation of air is practiced for economy in operation and the evaporator is placed directly in the circulating air stream. New bus designs appearing during the year provided space for a cooling unit and are thus built with an idea of permitting the addition of cooling as desired. Bus designers thus indicate their acceptance of the coming importance of air cooling in bus transportation. It is anticipated that 1939 will see a greatly increased number of cooling installations in buses with the time not far off when air cooling will be as generally provided in buses as is the case now in rail passenger vehicles.

Cooling of private passenger automobiles made no apparent headway during the year for no manufacturers of automobiles placed cooling equipment on their new 1939 models or factory equipment. Neither is there any such equipment now on the market as an accessory. However, it is known that a great deal of research and study is going forward in attempts to devise practical and acceptable cooling for automobiles. Changes in body construction and in heater grille location and arrangement indicate that advance arrangements are being made preparatory to introduction of cooling. No reliable statements are obtainable but there is a strong undercurrent of feeling that automobile cooling equipments will be on the market in the reasonably near future.

Airplanes and short run suburban railroad cars continued to use cooling methods worked out some time ago and consisting of portable coolers wheeled alongside the vehicles. Consensus of opinion is that these methods are adequate for planes and short-run cars generally and that they offer no immediate prospect of receiving intensive attention.

Statistics

A study of the year's statistics brings out a number of interesting points which, when summarized, tell a big story. The principal point is that the summer air conditioning business in general, judging from equipment sales, was off about 40% as compared with 1937.

The second point, and a significant one, is that of these equipments, self-contained air conditioning units showed a drop of only 10%. Third, while sales of central systems for comfort declined 47%, central systems for industrial applications fell off only 16%. Other outstanding developments included a sharp increase in the use of evaporative coolers in the southwest, an installation of a reverse-cycle job in California, as well as 3700 tons of installed cooling capacity at the World's Fair in New York. Data from monthly reports of orders booked, issued by the Department of Commerce, are summarized in Table 1 and show the first 10 months' sales for 1938 as compared with the corresponding period in 1937 together with the decrease shown in 1938 over 1937.

TABLE 2—SUMMER AIR CONDITIONING, 1938 AND 1937, BY BUILDING TYPE

Type	1938		1937	
	No.	Hp.	No.	Hp.
Commercial	67.0%	65.6%	65.9%	74.2%
Industrial	1.7	7.2	2.5	6.9
Theater and Recreational	5.9	18.4	4.6	12.8
Public and Institutional	2.0	4.5	1.6	3.7
Residential	23.4	4.3	20.4	2.4
Total	100.0%	100.0%	100.0%	100.0%

Reports from electric utilities are the only key to the distribution of business by type of installation. Figures for the first 10 and 11 months of 1938 from 17 utilities ranging in size from the Consolidated Edison Company of New York down show that commercial installations still constitute the bulk of the air conditioning business, accounting for 67% of the total number of jobs and 66% of the installed horsepower during 1938. Information from this analysis is summarized in Table 2 which shows the breakdown of these installations by type of building for both 1938 and 1937.

Several points should be made clear in connection with this table, the first being just what the classifications embrace. The industrial classification includes all factory installations whether for comfort or process; the theater and recreational group includes theaters and dance-halls; the public and institutional group covers hospitals, schools, and governmental buildings; while the residential classification embraces apartments and hotel guest rooms as well as homes. The commercial classification is a broad grouping of all other installations in stores, restaurants, taverns, hotel public spaces, radio stations, and similar installations in buildings where the motive is profit excepting theaters and factories.

TABLE 3—CLASSIFICATION OF 1938 AND 1937 NEW YORK AIR CONDITIONING INSTALLATIONS BY SIZE

Size, Hp.	1938		1937	
	No.	Hp.	No.	Hp.
Less than 10	36%	4%	30%	3%
10 to 20	21	7	22	8
Over 20	43	89	48	89
Total	100.0%	100.0%	100.0%	100.0%

SUMMER EQUIPMENT SALES STATISTICS

25 Unit Conditioners
Orders, Self-Contained Units, Dollars

	1936	1937	1938
Jan	36,263	448,985	340,842
Feb	76,582	201,771	328,862
Mar	123,861	1,154,521	762,710
Apr	102,788	739,433	807,127
May	509,024	835,541	849,833
Jun	479,685	1,271,474	660,351
Jul	321,844	495,691	495,091
Aug	93,502	144,976	349,067
Sep	75,940	79,652	270,395
Oct	54,202	193,577	156,907
Nov	106,728	97,287	—
Dec	254,789	63,463	—
YEAR	2,235,208	5,726,371	—

26 Unit Conditioners
Orders, Not Self-Contained, Dollars

	1936	1937	1938
Jan	215,420	651,713	270,412
Feb	192,763	781,665	597,693
Mar	639,665	1,327,605	568,645
Apr	541,155	961,899	583,126
May	878,797	832,975	595,700
Jun	763,884	1,046,960	440,011
Jul	678,146	987,105	428,438
Aug	552,492	563,807	389,332
Sep	359,941	462,990	324,982
Oct	523,992	404,779	291,100
Nov	477,603	405,760	—
Dec	750,591	297,961	—
YEAR	6,574,449	8,725,219	—

27 Central Systems
Comfort, Dollars

	1936	1937	1938
Jan	307,941	849,280	412,979
Feb	569,122	1,176,708	825,996
Mar	717,498	2,385,955	448,653
Apr	428,844	1,234,131	1,164,960
May	646,494	1,104,603	413,831
Jun	536,745	1,113,794	509,547
Jul	408,283	781,112	269,433
Aug	286,170	315,836	289,591
Sep	341,696	301,602	323,214
Oct	235,328	310,687	427,781
Nov	177,194	121,519	—
Dec	292,494	490,881	—
YEAR	4,947,809	10,186,107	—

28 Central Systems
Industrial, Dollars

	1936	1937	1938
Jan	78,706	73,412	20,225
Feb.	35,477	29,708	119,977
Mar	95,970	145,633	66,930
Apr	93,632	94,742	64,833
May	25,091	136,742	34,972
Jun	23,430	99,974	35,200
Jul	49,040	23,590	41,698
Aug	141,022	45,302	33,927
Sep	34,177	43,184	120,070
Oct	199,360	73,986	106,090
Nov	88,419	86,483	—
Dec	416,564	7,232	—
YEAR	1,280,888	859,988	—

The other point to be brought out is that in view of the rather small number of utilities reporting their figures to be included in this analysis, the subdivision of the total business by these relatively few utilities should not be taken too literally. For example, the horsepower of theater and recreational building installations in 1938 shows a large increase as compared with 1937 but a large part of this increase is due to the large number of installations made in one city. Similarly the World's Fair load and a 2200-hp. installation in Radio City in New York increased the commercial building classification somewhat over what it may have been on a nationwide basis.

In spite of these difficulties it is believed that the figures showing the increase in residential air conditioning are typical and reflect the slow trend toward both home and apartment air conditioning.

Statistics on installations made during the year are broken down in three size groups by the Consolidated Edison Company of New York for the installations in the territory served by that utility, which includes all of the boroughs of New York except Staten Island. A breakdown of 1938 and 1937 installations in this city is shown in Table 3 which brings out very clearly the increase in number of small installations.

Further information on the sale of evaporative coolers will be found in the material which is given in the reports from El Paso. The reverse-cycle refrigeration system mentioned in the introduction of this summary is mentioned in the report from San Francisco.

Following are the highlights of 1938 activity in summer air conditioning in reporting cities.

Baltimore—The Consolidated Gas, Electric Light & Power Company reports that 125 self-contained room coolers were sold in the first 11 months of the year installed either for office use or residential purposes. Prominent among the installations in this city was one in a public building with a capacity of 212 hp., and 67 office jobs totaling 400 hp.

Pittsburgh—The Duquesne Light Company added slightly over 1400 hp. to its lines in air conditioning load during the first 11 months of 1938 including one department store with a capacity of 36 hp.

Birmingham—Birmingham Electric Company, through W. W. McLaren, commercial sales manager, indicates that the most notable trend in that territory is that toward unit installations of 10 tons and less. This utility added 39 installations totaling 379 hp., including 65 hp. in a chain store and 40 hp. in a furniture store.

Atlanta—Georgia Power Company reports, through Robert Edmond, assistant power sales engineer, the addition of 49 installations totaling nearly 1200 hp. added during the first eight months of 1938. Among these installations were four banks totaling 379 hp., two exhibit spaces totaling 210 hp., and two industrial jobs totaling 86 hp. The largest installation was 288 hp. in the Federal Reserve Bank.

Cedar Rapids—The Iowa Electric Light & Power Company added 25 installations totaling 235½ hp., including two heater installations, each with 10-hp. deep well pumps.

Wichita, Kan.—Kansas Gas & Electric Company reports 1938 business approximately half of the 1937 total and consisting of 66 installations totaling slightly over 500 hp.

Des Moines—Des Moines Electric Light Company added 65 installations totaling 436 hp. during the first 11 months, with the largest single classification that of general offices with eight installations totaling 118 hp. Guest rooms in a Des Moines hotel totaled 39 hp.

El Paso—The El Paso Electric Company through H. A. Walsh, sales manager, reports that this summer 1375 small evaporative coolers were installed in homes and commercial establishments as compared with 450 of these installed last year. The outlook is that 1939 installations of this type will number over 2000. These installations during 1938 resulted in the air conditioning business in El Paso being up sharply over 1937. The largest installation during the year was one of 160 hp. in a chain store, while the most unusual installation was in a department store where evaporative cooling was installed.

Newark—The Public Service Electric & Gas Company, which serves northern New Jersey as well as Trenton and Camden, reports through H. P. Morehouse, general air conditioning representative, 172 installations totaling 2285 hp. during the first 10 months of 1938. The largest classification was 61 installations, totaling 486 hp., in retail stores.

Philadelphia—Philadelphia Electric Company, through H. H. Mather, industrial promotion, reporting on the first 11 months of 1938, indicates that installations were up in number over 1937 but down in horsepower. During this year 290 installations totaling 7872 hp. were installed as compared with 257 jobs totaling 8657 hp. during 1937. Of the 1938 total slightly over 1100 hp. was industrial load. Included in the total were two schools totaling 500 hp.

Pittsburgh—The territory adjacent to Pittsburgh but not including the city proper reports a decrease of somewhat over 20% in air conditioning during the year compared with the previous year.

Providence—The Narragansett Electric Company reports 16 air conditioning installations totaling 176 hp.

Richmond, Va.—Virginia Electric & Power Company reports for the Richmond district, during the first 10 months, 52 installations with a capacity of 1099 hp. and 856 tons of refrigeration as compared with 37 installations with a capacity of 388 hp. and 327 tons in 1937.

Washington—Potomac Electric Power Company during the first 11 months of 1938 added 189 installations totaling 4126 hp. as compared with 218 installations totaling 6452 hp. in 1937. Of the 1938 installations 14 with a capacity of 1597 hp. were governmental jobs. Two installations in apartment houses totaling 362¼ hp. were prominent in this city.

Detroit—Detroit Edison Company, through S. S. Sanford, reports that during the first 11 months of 1938, 182 installations totaling 3256 hp. were added as compared with 336 totaling 4120 hp. added in 1937. The largest installation in the year was one of 400 hp. in an automobile plant. Notable among the installations in this city was an ice cooling system in a church.

Portland, Me.—Cumberland County Power & Light Company reports the sale of six ¾-hp. room coolers in this territory during 1938. Additional installations, all commercial, numbered four and totaled 20¾ hp.

Wheeling—A complete office conditioning system was installed in the Fidelity Investment Association Building here during 1938. The total business in the territory was slightly over 1937, with a trend toward 3- to 5-hp. units.

Toledo—Toledo Edison Company, through Ralph E. Paxton, power representative, reports 40 installations totaling 225 hp. as compared with 40 installations totaling 432 hp. in 1937. There were no large jobs in this city during the last two years. Stores in the outlying district are reported to be increasing room cooler purchases. The largest installation during the year was one of 30 hp. in a bank.

San Francisco—Pacific Gas & Electric Company through R. E. Fisher, vice-president in charge of public relations and sales, states that a 15-hp. reverse cycle installation was made in an office building using the outside air as a heat source. The largest installation was one of 86 hp. in the State of California office building.

Kansas City—Anson D. Marston, industrial engineer, Kansas City Power & Light Co., reports that during the year 179 installations totaling 1291 tons and 1413 hp. were added in that city. These included a 176-hp. installation in a store and a 120-ton absorption refrigeration job using utility steam.

Raleigh—The Carolina Power & Light Company, through H. M. Hicks, reports a 75-hp. installation in a theater in that territory. The business added during 1938 was down sharply from that in 1937.

Omaha—Business in this territory was down sharply—54%—from 1937. The largest installation was one of 1466 hp. in the headquarters of the Union Pacific Railroad.

Mt. Vernon, N. Y.—The Westchester Lighting Company reports air conditioning installations during the year about the same as during 1937. The largest installation was one of 57 hp. in a restaurant in New Rochelle. A Mt. Vernon hospital operating room was also conditioned.

Manchester, N. H.—The Manchester Electric Company reports six self-contained unit installations, a 15-ton theater job and a 3-ton industrial job as well as a 15-hp. installation in the Amoskeag Bank.

Houston—The largest installation in this city during 1938 was one of 1235 hp. in the Esperson Building. Other important installations included the Rice Hotel, Texas State Hotel, and Lamar Hotel.

Denver—The Public Service Company of Colorado, through J. M. Eakins, reports a 20-hp. installation in the Denver Post Printing and Publishing Company plant. This utility indicates that people in that territory are becoming more winter air conditioning minded.

Buffalo—The Buffalo Niagara & Eastern Power Company, through W. P. Davis, reports air conditioning in that city down 12% from 1937, with the largest 1938 installation that of 282 hp. in Neiser's department store. The trend in this city is toward unit installations in small stores.

Akron—The Ohio Edison Company, through W. P. Cook, reporting for the Akron Division, indicates that business in that city was down sharply over 1937 with the largest installation one in a theater totaling 47½ hp.

New York—Two notable developments in New York; addition of a 2200-hp. load in two office buildings in Radio City and the nearly 3600 hp. in summer air conditioning at the World's Fair in Queens. The World's Fair load to date is made up of 30 installations of which 26 are over 20 hp.

Indianapolis—Outstanding here was a 246-hp. combination well water and mechanical refrigeration job in Woolworth's. The mechanical refrigeration was 160 tons. The year's business was down sharply from 1937, according to E. S. Hildreth of the Indianapolis Power & Light Co.

Air Conditioning with Ice in 1938

The season of 1938 did not witness any fundamental changes in systems or methods of installation of ice air conditioning. Principally the year was characterized by widening applications of ice systems in various sections of the country. During the year a number of the legitimate theaters in New York's Broadway section installed ice systems to provide comfort for the patrons of the many plays which continued their runs throughout the summer.

Additional ice air conditioning systems were installed in churches during the year. The ice system is especially well adapted to this type of service because at low installed and operating costs it furnishes high peak duty and can precool the church interior at a very

rapid rate. Notable among these installations is the ice air conditioning system in the First Church of Christ, Scientist, in New Orleans. This church has a seating capacity of 750 people with total air conditioned space of 180,000 cu. ft.

The installations made in the West Coast territory have continued to feature combined use of cooling tower water, or water from municipal supplies or wells in conjunction with lower temperature water produced from ice. These two stage systems which have been described before (See HEATING & VENTILATING, January, 1938, page 84) employ the cooling tower or other water supply to do sensible cooling of the air in a primary coil. The remainder of the air cooling and the necessary dehumidification are accomplished in a secondary coil by the cold ice water. This type of system has met with very good acceptance from the users.

Originally the principal objective in making these combined installations was to reduce ice consumption to the very lowest minimum. Experience has shown that they have additional advantages. For instance it has been difficult in the past to maintain satisfactory odor conditions and truly fresh air in restaurants and cafeterias if any appreciable amount of air is recirculated. These combined systems have so greatly reduced the ice consumption that it has proved to be quite feasible from a cost standpoint to operate the combined systems with 100% fresh air. This situation has proved equally pleasing to patrons, as well as the owners of the ice air conditioned establishments. A number of the theaters which are equipped with the combined or two stage systems also operate with 100% fresh air supply because they have found the excellent air conditions thus maintained are especially attractive and pleasing to the theater patrons.

Well Water for Air Cooling in 1938

By HERBERT C. ANGSTER
Secretary,
Electric Water Systems Council

The use of well water for complete summer air conditioning is growing rapidly in those sections where the well water is cold enough and sufficient in volume. There has also been an increase in the number of installations in which well water is used for precooling in places where the temperature of the water is high or the quantity is not sufficient to do the entire job.

Indicative of the growing acceptance of air cooling with well water is the fact that one large manufacturer of automatic electric plumbing equipment reports that 10% of pumps sold in 1938 were used in air conditioning work.

Wherever naturally cold water is available at moderate cost, air cooling with well water has proved practical and economical. Owners of well-insulated 10-room houses have reported that it cost them only $20 to cool their houses during the entire summer. These reports were received from homeowners in Chicago suburbs.

An increasing use of well water for air cooling in industrial and commercial structures is reported. A large number of department stores and theaters are being cooled with well water. Several applications of well water cooling to industrial establishments were described in recent months (See HEATING & VENTILATING, page 36, November, 1937, and page 25, February, 1938).

One of the interesting developments is the introduction of a package unit which includes everything required for complete winter and summer air conditioning. The equipment offered in the "package" provides heating by means of a split system, utilizing hot water, and cooling by means of well water. Included in the package are the automatic electric pump, cooling coils, hot water boiler, pump for the forced circulation of the hot water, humidifier, filter, the necessary direct radiation or convection, and the controls. The same coil is used for cooling and heating. The "package" comes in 24 different sizes, the smallest providing equipment large enough to cool one room.

The smaller units have found a particularly large acceptance in small establishments such as restaurants, beauty parlors, barber shops, and drug stores. The usual procedure is to install the unit at the front end of the store or just above the entrance way where it discharges cooled air to the back of the building and makes a complete recirculation without ductwork. This reduces the cost of the installation yet provides very satisfactory cooling service. It is possible to run the well water pipes alongside the doorway to the unit and bring the return lines back the same way, together with condensation drain to the sewer.

Improvements in the component parts of a well water cooling installation, particularly in the pump, the coil, and installation methods, are reported. More attention is being given to reducing noise. The position of the pump with reference to the rooms to be cooled is being given greater consideration. The importance of a sturdy, well-made pump with automatic lubrication is more generally understood. The pump, as the heart of the cooling system, must be carefully installed and well insulated. Mounting of the pump on rubber cushions as well as the use of a short piece of rubber hose at a convenient point in the line, leading from the pump to the coils, has been found helpful in reducing noise to a minimum.

Interesting trends with respect to well capacities are noted. One is the stressing of adequate water capacity when water is used for the cooling of larger commercial and industrial buildings. Another is the fact that, in the case of individual one family residences, it has been found that one well may provide sufficient water for the use of three or four families. This trend toward the use of one well by several families is particularly noticeable in suburban districts.

After the well water has served its initial function of removing heat from the indoor air, this return water is sometimes sprayed on the roof of the building being cooled, thus reducing the sun effect on the roof and consequently lessening to some extent the heat gain to be overcome. This practice has become quite common in commercial cooling applications. If conservation of water supplies is desirable, a second well may be drilled to receive the discharge.

Water varies in its chemical properties. In some sections the neutralization of excessive acids may be necessary to protect coils, pipe, valves, and fittings against corrosive conditions.

Improvements have been made in coils used for air cooling with well water. Coils have been streamlined to cut down air resistance. Fins have been spaced further apart to avoid condensation.

Suggestions for the application of well water cooling are outlined in a pamphlet issued by an organized group, copies of which pamphlet are available.

Self-Contained Units and Electrically-Driven Compressors

By WILLIAM B. HENDERSON
Executive Vice-President
Air Conditioning Manufacturers' Ass'n.

During 1938 there were probably more new developments in self-contained air conditioners than in any other department of the industry, as manufacturers extended their lines from the small-sized room cooler up to large units capable of conditioning a medium-sized restaurant, a specialty shop, or a whole suite of offices. Originally, the room cooler was a summer air conditioning unit only and, with 1 ton or less of capacity, could satisfactorily air condition but one room. It was the first member of the family of self-contained air conditioners which, during 1938, grew to include 3, 5, 7½, and 10-ton sizes. At least one company has a 15-ton conditioner in its line for 1939. The larger sizes are generally available with heating coils and humidifiers so as to perform a complete, year-round job of air conditioning. The small room cooler remains basically a summer air conditioner, but with considerably increased capacity over the earlier units and with smaller outside casing dimensions.

The new lines are the air conditioning industry's answer to the public demand for packaged air conditioning. They are designed primarily for the commercial market—stores, restaurants, hotels, and offices—which want air conditioning installed with a minimum of structural changes in the building. For simple layouts, where the air throw is not long and other considerations are favorable, conditioned air is distributed through grilles in the top of the cabinet without any ductwork; but in a majority of instances in the commercial field the conditioned area is complicated by shape and arrangement problems which involve the necessity of multi-point air distribution and, consequently, some ductwork. Even so, when the owner's lease expires, he can easily move the air conditioner to his new location along with his other fixtures and furniture.

To the heating and ventilating contractor, the new self-contained units represent a line of products which can be readily dovetailed into his present selling and installation practices. The refrigerating engineering phase of the air conditioning problem has, to a large extent, been worked out at the factory. Elements of the refrigeration system are properly matched; refrigeration connections are all made; internal electrical wiring is finished. Aside from the choice of the proper capacity in a unit, the heating and ventilating contractor has only water and power connections and possibly some few air-distributing ducts to install. These field operations will not unduly tax the usual ingenuity of the experienced heating and ventilating contractor.

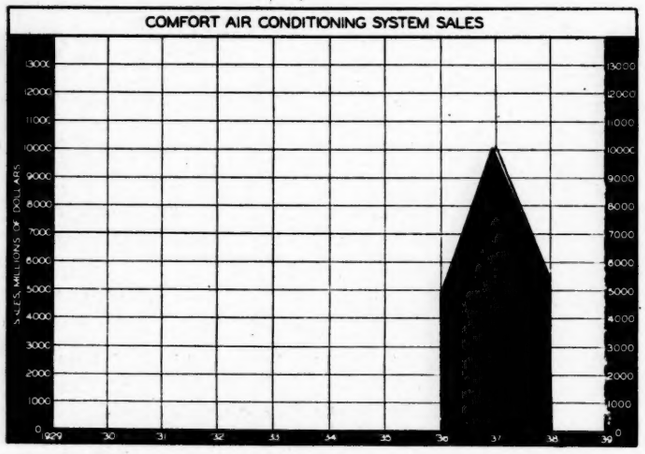
Artistically, 1938 equipment is highly advanced over the relatively crude-looking room coolers of several years back. In styling exteriors, prominent industrial designers were consulted with the result that current models are well proportioned and attractively finished and blend in with even the most unusual decorative effects. When desirable, cabinet exteriors may be painted in various shades to match a particular color scheme. In sizes larger than 10-ton, self-contained units probably will not have styled exteriors. However, this larger equipment is usually installed in the basement, a closet, or some other out-of-sight location.

Technically, the 1939 models incorporate many refinements which are the natural result of the several years' experience with this equipment in the field. Chief improvement is the greater capacity, coupled with important reductions in physical size. Better cooling capacity for the same electrical input is largely due to refinements in compressor design (higher rotative speeds, greater efficiencies), more efficient air-cooling surfaces of the coils, and improved condensers. Most of the 1-ton units today are equipped with air-cooled condensers which, to speed up the condensation of refrigerant, employ the evaporative cooling effect of moisture condensed out of the room air. It was this development which eliminated the need for water connections and gave room coolers portability. Greater compactness is achieved by better utilization of cabinet space, with remarkably ingenious "bending over and doubling back" of the various parts.

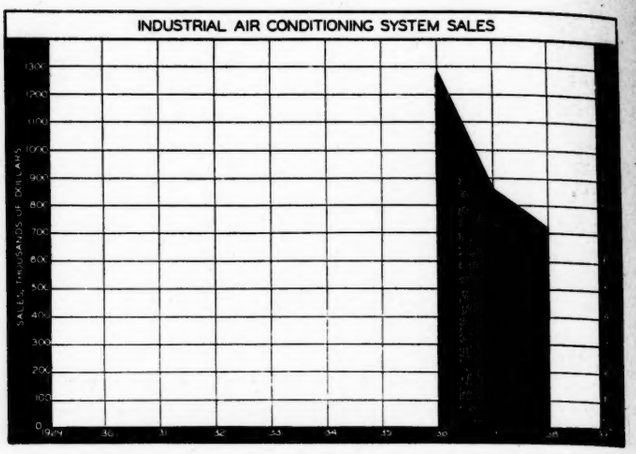
Reduction of the noise level has been one of the basic design objectives in the new equipment; not that the noise factor has been any hindrance to sales in commercial fields but the makers believed that the noise level should be minimized for the eventual greater penetration of sales of air conditioning into living quarters.

Whereas the early remote-type room coolers often neglected to bring in outside air to dilute and remove tobacco smoke and odors, the new units, without exception, recognize the necessity for ample fresh air introduction through an outside air connection of one type or another. One of the new 1-ton units even has a room air exhaust feature which pumps out stale air from a room, and replaces it with fresh air drawn from the outside. Window grilles of the new room coolers are designed so that the appearance of the building from the outside will not be impaired by a multitude of window ducts. Filters, in both outside air intakes and recirculated air streams, are integral in all models.

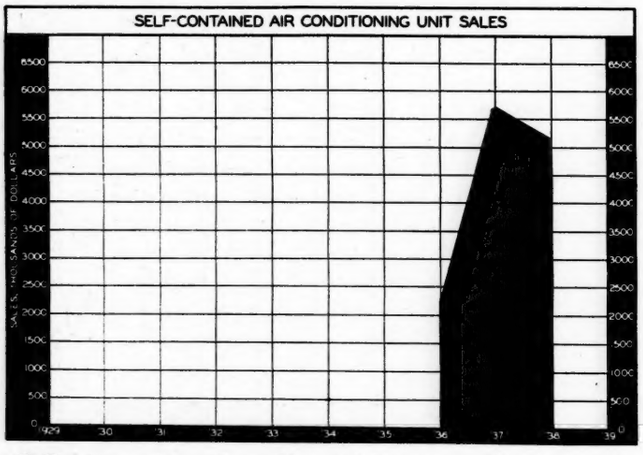
Advances in compressor design are reflected in the machines used in self-contained air conditioners and in the separately installed cooling plants which are a part of the larger central station systems. Today, compressors require considerably less space, largely because they can be operated at the higher speeds made possible through improved shaft seals, better valve design, and increased knowledge, through research, of the metallurgy of compressor castings. A number



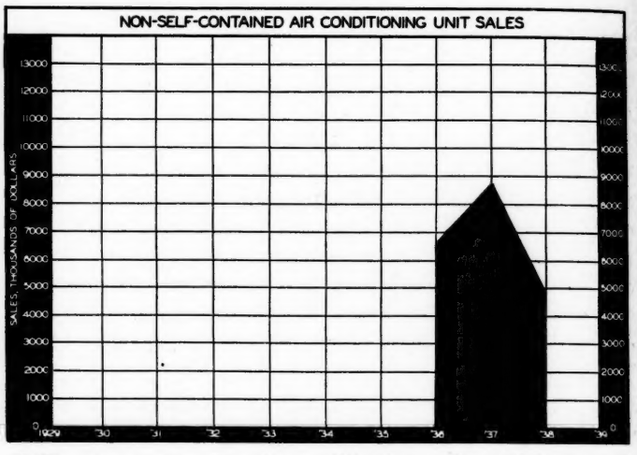
27 **Sales, as indicated by new orders, of air conditioning systems installed for comfort purposes, and as reported by manufacturers. Comparable data not available prior to 1936.**



28 **Sales of air conditioning systems installed in industrial plants. Figures are in terms of new orders reported by manufacturers. Comparable data not available prior to 1936.**



29 **New orders for self-contained air conditioning units as reported by manufacturers. Comparable data are not available prior to 1936.**



30 **New orders for air conditioning units which are not self-contained, as reported by manufacturers. Comparable data are not available prior to 1936.**

of machines are now direct-connected to motor, attaining speeds as high as 1750 r.p.m. More than one manufacturer is building a completely sealed-in machine, with compressor, motor, and even the water-cooled condenser inside a steel casing. Higher compressor speeds have brought the design and use of forced lubrication systems.

Steam Jet Refrigeration

As in the preceding year, sales of steam jet equipment for air conditioning showed a decline. This method of producing a supply of cold water has much to recommend it but can be applied to best advantage where there is a steam supply available for which the investment can be charged against something else. Also there is little operating experience from steam jets.

In New York where the steam heating utility company has shown outstanding interest in promoting the steam jet for air cooling purposes an economy control has been worked out and has been applied to four successful installations. In one restaurant complete push-button control has been achieved to such an extent that the operation is reported to be as simple as with electric compressors. A large restaurant chain equipped its two newest restaurants with steam jet equipment. A large capacity (65 tons) evaporative condenser was successfully applied and is now available in standard form up to 100 tons.

Guarantee performances are reported to be slightly better. The impetus given to the rational use of higher chilled water temperatures in controlled reheat circuits is beginning to be felt on newer installations.

Many people in close contact with developments feel that much remains to be done in applying factory prefabrication to steam jet equipments for air conditioning. At the year-end, therefore, it can be stated that the steam jet is still receiving close study, is undergoing development, and that it remains as an interesting possibility for making use of a low-cost energy.

The Condenser Water Problem

The trend toward evaporative condensers which has been going on for the past several years continued throughout 1938. However, as time goes on it is becoming increasingly apparent that the choice of using straight water-cooling without re-use or of installing evaporative condensers is turning on the item of cost. Where water is cheap and plentiful there is usually little need for anything but straight water cooling.

During the year too it became clear that the use of

evaporative condensers is sectional. Throughout the south and southwest the evaporative condenser is coming into such wide use that some installers report that nearly all their jobs use this equipment. In the north and east, however, there is still a predominance of water-cooled condensers. It should be noted that in the south and southwest the temperature of the available water supply is relatively high, necessitating the use of large amounts of cooling water and that water is relatively scarce in these sections also. Consequently, the price and cost of water is relatively high, setting up the situation for re-use of the water through evaporative condensers.

Frequently too, condensing methods depend on strictly local conditions as is evidenced by the case of one city in the north where water rates within the city limits are reasonable but are nearly tenfold greater in the suburbs. The result is that while installations located in the city proper frequently call for evaporative condensers, those in the suburbs positively require them.

Another local condition arises where an owner has an ample water supply through a well but is not permitted to discharge the necessary amount of warm condenser water into the public sewer. In such cases evaporative condensers are frequently a necessity.

By the year-end the evaporative condenser had firmly established itself in air cooling practice and is no longer considered a novelty. Its extension into wider application seems likely to remain as a cost consideration for some time to come.

Storage of Refrigeration

Storage of refrigeration, was applied to a number of air conditioning jobs in 1938. Since there is indication that reduction of demand is going to be of increasing importance for some time to come, methods of applying and results obtained from it are of present interest.

The fundamental idea is to provide means whereby the refrigeration equipment may be so operated that at times of low load, energy may be stored up. This is then available to be drawn upon to carry the increased load at times of high demand. The usual means of storing the energy is by freezing water in a space provided for the purpose.

Much leeway is possible in the application. Two general methods are usually considered. One is to provide a power supply equal to the average load, let this be supplied continuously throughout the 24-hour period regardless of load fluctuations. The other is to shut the supply off entirely during the hours of peak demand and to fix the supply rate at a point where enough energy is stored to supply the total load in the hours when the equipment operates. Either method may improve both the maximum demand and the load factor of the installation. In most cases the method to be used can be determined only by careful study of the requirements of each job.

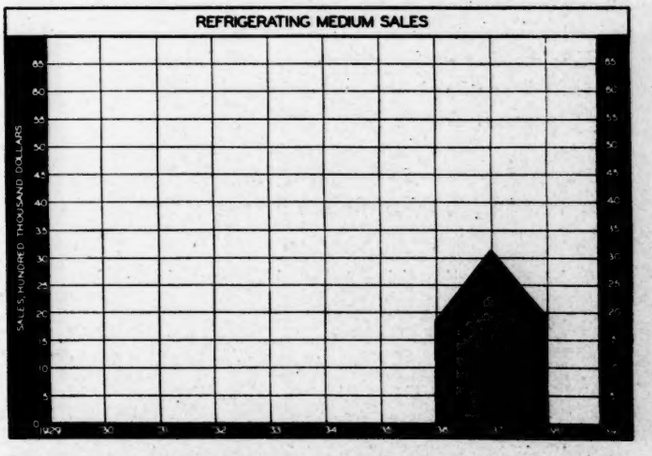
As is true of many of the other later developments in air cooling, the early installations are being made in the southwest. During the year a number of installations of this kind were reported in Missouri and Kansas. In Dallas, three office building plants went into operation during the summer with computed cooling loads reported at 300, 340 and 640 tons, respectively. They were served by compressors rated at 160, 200, and 415 tons, respectively. Early operating results indicate that seasonal load factors will be about double those of equivalent non-storage installations.

An article describing one method used in adapting storage refrigeration to a small theater was published under the title "Storage Refrigeration Cuts Theater Cooling Cost 66%" in HEATING & VENTILATING in the December, 1938 issue, page 20.

Absorption Cycle Refrigeration

Recent shifting of system peak on electric utility lines from winter to summer is among the considerations which have caused the absorption cycle of refrigeration for air cooling to be examined with renewed interest in many quarters. This cycle permits applying any of the fuels direct to the production of cooling capacity without making use of an intermediary like steam or electric energy. The cycle has been used in ice-making plants in large capacity units and in domestic kitchen refrigerators in extremely small capacities. Until recently, however, its adaptation specifically and deliberately to meet the requirements of air conditioning has not received the attention which its inherent characteristics indicate that it deserves. Suitable use of this cycle in connection with winter heating would appear to be the best possible combination in the long run for securing a high annual load factor with resulting advantages from such a situation.

Notable during the year was a growing realization that where the same utility company distributes both gas and electricity it might be desirable to divert some of the energy supplied for air cooling from the electrical system to the gas lines. It should be kept in mind that in some of the largest and most densely populated districts this indentical ownership of the utilities exists. If a policy of definitely favoring use of gas where possible were fully carried out, its long term effects on the direction taken by equipment developments may be far-reaching. So far as the year 1938 was concerned it is not established that such policies were definiteely fixed by utility interests but it is true that the situation was examined with care by some of them. A knowledge of these studies may have had something to do with the increased interest



31 New orders for refrigerating medium used largely for air conditioning work, as reported by the manufacturers. Comparable data are not available prior to 1936.

in the cycle on the part of equipment makers generally. While this did not result in the actual appearance of absorption cycle equipment on the market during the year still many of the plans are reported as being near the stage where the equipment will be forthcoming shortly. In the meantime details of how it will be worked out are not available.

In HEATING & VENTILATING in October, 1938, an installation where the absorption cycle is used for year-round conditioning was described. While this particular installation makes use of an indirect-fired steam supply, the equipment can be arranged for applying the heat by direct means and it is reported that direct gas-fired equipment is under development. It is indicated that steam requirements for the equipment described is about 21 lb. per ton-hour, equivalent approximately to 0.2 gal. oil, 0.284 therms of gas, or 3 lb. of coal. Other estimates indicate that 50c natural gas would be equivalent to electricity at 1½c per kw-hr. Some 25 to 50 installations of this particular equipment are said to be in existence and operating at present.

Engine Drives for Refrigeration Compressors

Gas powered engines for driving refrigeration compressors and the necessary auxiliaries for air cooling have been used in natural gas territories for some time. The number of such installations is relatively small being estimated in a report of an A.G.A. committee at less than 200. The total horsepower represented by these installations is also not known. Active promotional efforts to secure additional use of natural gas engines to replace electric energy were reported being made in but a few cities during 1938.

Operating experience gathered from these installations indicates that most refrigeration compressors can be readily operated by gas engines with either direct drive or by the use of belt connections. Increased interest in these engine drives was evident during 1938 and the possibilities are undergoing close study and analysis. A great variety of engine and compressor arrangements are possible and many of them are already on the market in some form. At the year-end there was no clear indication of how important a factor in air cooling the gas engine drive may become. It does not appear to be a development which will show any sudden growth nor does it appear that these engines can be expected to find acceptance outside of natural gas territories.

Engine drives for air cooling equipment using oil as the fuel received little public attention during 1938. No group appears interested in studying and promoting oil engines for this purpose and the few installations made make use of equipment designed for other purposes and adapted to fit the particular installations.

Adsorptive Dehumidification

Substances like silica gel and activated alumina which depend on their ability to adsorb moisture from air brought in contact with them have been in use in this industry for so long a time that most are at least familiar with their action and with the equipment whereby they are applied. During 1938 additional installations were made and it is reported from sources believed to be reliable that 20% more such installations were made in 1938 than in 1937—a showing which is comparatively very creditable. Equipment tended toward added simplicity, greater compactness, while larger sales point toward reduced prices.

The adsorbents profited from the tendency on the part of designers and purchasers to analyze loads more closely and to evaluate more carefully the various factors entering into total costs to the owner where conditions are variable and out of the ordinary. It seems generally recognized that present limitations on these methods can not be defined without close study but that generally they can be used to best advantage for air conditioning where there is an adequate water supply at not more than 70F and where suitable fuel for reactivation is available. Also their indicated use is where there is a high latent heat load.

The adsorbents also profited by the active support given to their use by the gas utility companies and by better marketing arrangements during the year.

The case for adsorptive conditioning is well summarized in the article "Desirability of Adsorption Dehumidifiers in Air Conditioning" by Bayard P. Fonda in HEATING & VENTILATING, May, 1938, page 37. An application of activated alumina to a specialized air conditioning problem appeared under the title "Air Conditioning Helps Smash the Atom," in HEATING & VENTILATING, December, 1938, page 18.

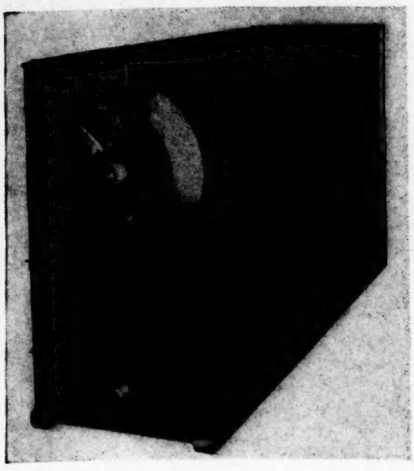
Chemical Dehumidification

For some time there has been much technical interest in methods of applying absorbents to the air conditioning problem, and especially to air dehumidification. Methods and equipment using calcium chloride, calcium bromide, or lithium chloride brines have been in development and during 1938 these processes continued to attract attention. They have been applied to industrial problems previously but in 1938 found some interesting applications in comfort and special processes outside of industrial plants. Some 500 guest rooms in a large Chicago hotel were conditioned by a lithium chloride installation as was a hospital. Calcium chloride was installed in laboratories where a wide range of exact humidities at various temperatures were necessary, also in banks as well as in industrial and commercial buildings. By the end of the year there were thus applications in such a variety of buildings and under such widely varying requirements that the ability of the equipment to meet operating conditions as they arise is well demonstrated.

During the year too a knowledge of the principles and of the limitations of these absorbents as applied became more widely held. The fact that they offer a means of changing the humidity independent of the temperature became better appreciated by engineers, contractors, and technicians generally. With equipment well developed and with operating data at hand these methods now bid fair to secure a rapidly increasing acceptance in those situations when their peculiar advantages can be made use of.

One prominent manufacturer has recently announced a newly developed brine which makes possible the drying of air to extremely low dewpoints and which at the same time can be concentrated at comparatively low temperatures, as supplied, for instance, by exhaust steam.

PROGRESS IN 1938 SUMMER EQUIPMENT



Marley Cooling Towers

NAME—Small induced draft cooling towers.

PURPOSE—For supplying cooling water to equipment of small capacity.

FEATURES—This is a complete series of small steel-cased induced draft cooling towers, including horizontal wood filled types for use indoors and vertical types for outdoor service, either wood or spray filled. Towers incorporate all the features of the larger Marley mechanical draft units, including patented non-clog spray nozzles of bronze and galvanized steel pipe headers and nozzle arms. Indoor towers are horizontal in construction and in air movement. Casings and basins are 16 gage copper bearing steel, shop painted two coats. Zig-zag drift eliminators of heart redwood and cast iron spacers are built as one unit, easily lifted out for access to the tower interior. Removable redwood decks and spacers constitute the filler through which the water filters down after down-spray injection at the top. Towers are shipped fully assembled ready for operation. The vertical outdoor towers are available in either wood-fill or spray-fill types and are equipped with multiple-effect drift eliminators of heart redwood with cast iron spacers and Marley fans having V-belt drives. In the wood-fill type water is upsprayed at the top and decking is of heart redwood. Two levels of downspray nozzles are provided in the spray-fill types. Both types are shipped in knocked down, easily handled units.

SIZES AND CAPACITIES—28 models with four standard sizes of indoor towers ranging from 2½ ft. x 7½ ft. x 3 ft. 2½ in. to 2½ ft. x 8½ ft. x 6 ft. 8½ in. Each type of outdoor tower is available in 12 standard sizes from 2½ ft. x 2½ ft. x 9 ft. 1 in. to 10 ft. x 10 ft. x 14 ft. 3 in.

MADE BY—*The Marley Co., Kansas City, Kan.* 1

Westinghouse Air Conditioning Units

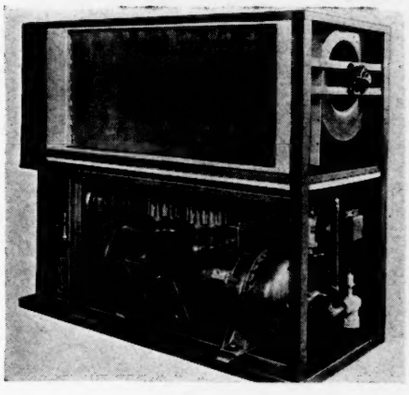
NAME—Unitaires.

PURPOSE—Self-contained conditioning units for commercial establishments.

FEATURES—Three of these units are of the central systems type and four are for installation within the conditioned space. Units require only power, water, and drain connections and are so designed that they can be carried through a 3-ft. door opening. A hermetically-sealed compressor is incorporated in each unit. Two switches permit maximum flexibility of operation, one controls the entire cooling mechanism and the other the blower motor so that air circulation may be obtained when cooling is not necessary. Provisions have been made for adding heating coils and humidifiers, thereby providing year-round air conditioning. The 15-ton Unitaire is illustrated.

SIZES AND CAPACITIES—Seven sizes with capacities ranging from 1 to 15 tons; in combinations to 30 tons.

MADE BY—*Westinghouse Electric & Mfg. Co., Air Conditioning Div., East Springfield Mass.* 2



Sterling Deep Well Pump

NAME—Sterling small capacity deep well turbine pump.

PURPOSE—For pumping from 10 to 60 g.p.m. to 300 ft. head.

FEATURES—This pump is designed for application where from 10 to 60 gal. of water is required per minute and where a well of at least 6 in. inside diameter is available. Pump is designed for 2, 3, or 5 hp. motors, single and three-phase, to operate at a speed of 1760 r.p.m. on 60 cycle current. It may be set to a depth of 200 ft. in the well. The pump will deliver varying capacities depending on the head required. For example, 10 g.p.m. can be delivered from 140 to 300 ft. head, while 60 g.p.m. can be delivered from 90 to 195 ft. head.

MADE BY—*Sterling Pump Corp., South Bend, Ind.* 3

Indian Trailer Room Cooler

NAME AND MODEL NUMBER—Koolroom room cooler, Model 33A-WS.

PURPOSE—A window unit for cooling small rooms.

FEATURES—Unit is designed for installation in windows and requires only an electrical connection. Equipped with a 1/3-hp. motor and circulates 200 cu. ft. of cooled air per min. Retail price is stated to be $175.

CAPACITIES—4000 B.t.u. per hr.

MADE BY—*Indian Trailer Corporation of America, Chicago, Ill.* 4

Kauffman Room Cooler

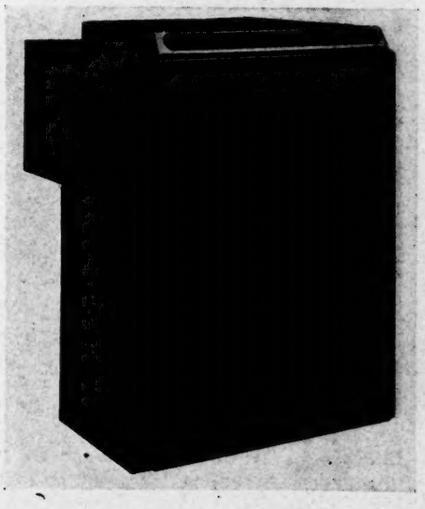
NAME AND MODEL NUMBER—Portable room cooler, types A, W, and Y.

PURPOSE—For cooling, dehumidifying, cleaning and circulating air.

FEATURES—All of these units are of the portable type and are designed to be installed either in a window or next to it. The type A is for floor installation while types W and Y are for window installation. It is said that the type A unit will comfortably cool 4000 cu. ft. of space, with average glass or window openings, lighting and two occupants. The type W unit is said to be capable of cooling 2500 cu. ft. with ordinary exposures, while the type Y is designed to cool 1500 cu. ft. The latter two types will plug into any light socket.

SIZES AND CAPACITIES—Type A cooling capacity, 10,000 B.t.u. per hr.; air delivery, 350 c.f.m.; power required, 1 hp. Type W cooling capacity, 6000 B.t.u. per hr.; air delivery, 275 c.f.m.; power required, ½ hp. Type Y cooling capacity, 4000 B.t.u. per hr.; air delivery, 200 c.f.m.; power required, 1/3 hp.

MADE BY—*Kauffman Air Conditioning Corp., St. Louis, Mo.*.....5

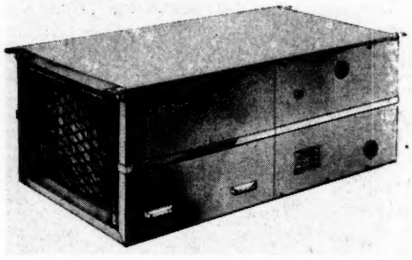


Wagner Evaporative Type Cooling Fans

NAME—Wagner evaporative cooling fan assemblies.
PURPOSE—These fan assemblies are designed for use in evaporative cooling devices such as are used in the southwest United States for air cooling.
FEATURES — During the past few years a large number of buildings in southwestern United States have been cooled with evaporative type coolers. The method of construction consists of a windowbox with an excelsior or fiber mat placed in a vertical position with provision at the top for dripping water through the excelsior or fiber pad. Cooling is produced by drawing large volumes of air over the moist mat, thus providing active circulation of cool air through the building. These fan assemblies are designed especially for use with this type of device. The fan blades are of the slow speed exhaust type delivering large volumes of air with a minimum of noise. Motors available are provided with either one end enclosed or totally enclosed to prevent the entrance of dust and moisture.
SIZES AND CAPACITIES—Available in six sizes with capacities ranging from 1550 to 4000 c.f.m. Motors available in either 110 or 220 volts, 25 or 60 cycle, single or three-speed type.
LITERATURE AVAILABLE—Bulletin 185.
MADE BY — *Wagner Electric Corp., St. Louis.* 6

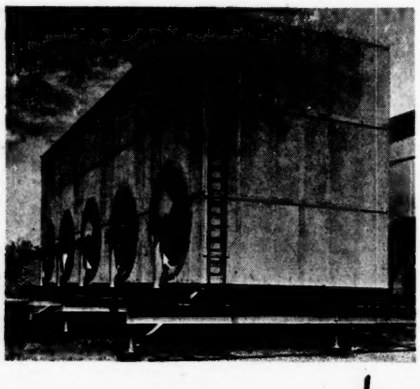
Modine Unit Cooler

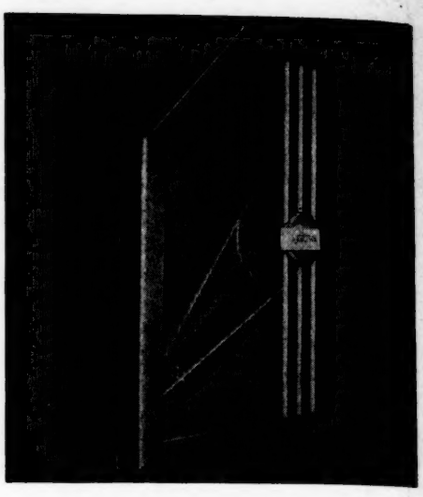
NAME AND MODEL NUMBERS—Blower type unit cooler, Models 35, 68.
PURPOSE—For cooling stores, offices, and like applications.
FEATURES—Unit filters, cools, dehumidifies, and circulates the air. The blower fan which is incorporated in the unit is said to have a capacity for overcoming external resistance which permits it to be used with duct work if desired. When used without ducts it may be suspended from the ceiling and by using a directional flow grille proper air distribution may be obtained. It is said that the design of this cooler allows it to be completely concealed after installation. It may be installed in a rear room, above a false ceiling or shelving, or in any convenient location. All access to the unit and its parts is from one side of the cabinet. Unit is made in two sizes, 48 in. in length, 17 in. in height and either 25 or 40 in. in width, depending on model. Units are available with either cold water or direct expansion (Freon) cooling coils.
SIZES AND CAPACITIES—Model 35 has a capacity of 26,700 B.t.u. per hr. sensible cooling at 85F d.b. entering air with 40 lb. per min. water flow and 0 in. water external resistance. Model 68 has a capacity of 50,500 B.t.u. per hr. sensible cooling at 85F d.b. entering air with 60 lb. per min. water flow and 0 in. water external resistance.
LITERATURE AVAILABLE—Bulletin 438-A.
MADE BY—*Modine Manufacturing Co., Racine, Wis.* 7



Lilie-Hoffmann Cooling Tower

NAME—Lilie-Hoffmann cooling tower.
PURPOSE—A fire resistant cooling tower for cooling water for air conditioning condensing units.
FEATURES—This tower has specially designed features to come within the fire restrictions, the shell being made of ⅜-in. transite which is bolted to steel framing installed on the interior of the tower. It is said that no painting is required as the life of the transite is unlimited.
SIZES—From 100 to 10,000 g.p.m.
MADE BY—*Lilie-Hoffmann Cooling Towers, Inc., St. Louis, Mo.*.....8





American Blower Attic Fan

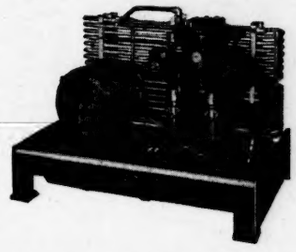
NAME—Ventura home conditioner.
PURPOSE — For residential cooling using night air.
FEATURES—This unit incorporates a number of features to give quiet operation, including a streamlined air inlet, rubber mounting of motor and also rubber mounting of the acoustically treated housing. A safety guard in the form of an attractive grille is available for open installations. Unit may be installed in louvered sidewall opening or in a suction box over the ceiling grille. Fan is housed in sheet steel which is finished in black morocco crinkle.
SIZES AND CAPACITIES—Six sizes with capacities ranging from 7500 to 21,500 c.f.m.
MADE BY—*American Blower Co., Detroit, Mich.* 9

Delco-Frigidaire Air Conditioner

NAME — Delco-Frigidaire air conditioner.
PURPOSE—For summer air conditioning of residences, offices, hotels, and hospital rooms.
FEATURES — This room conditioner incorporates the hermetically sealed meter-miser refrigerating unit which is used in this company's refrigerators. The conditioner requires only a connection to the power circuit and fitting to an adjustable window section. The manufacturer states that it can be used with both double sash and casement type windows. A comfort control is provided to govern the cooling effect of the unit and to prevent overcooling. Air direction may be controlled by an air direction selector incorporated on the instrument panel of the unit. All air passing into the room is filtered. The unit is designed to market for $399.50 installed.
CAPACITIES—1300 lb. of ice-melting equivalent per 24 hr.
MADE BY — *Delco-Frigidaire Conditioning Div., General Motors Sales Corp., Dayton, Ohio.* 10

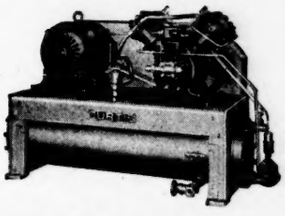
Check these facts about **CURTIS**

Typical Curtis Units

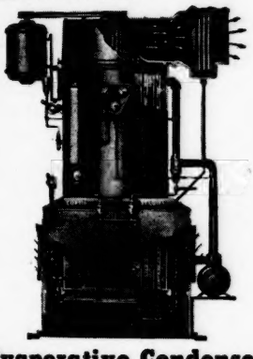


Air Cooled Condensing Units—*1/4 to 5 hp. sizes* — For commercial cooling. Extra large air-cooled condensers and condenser receivers.

Water-Cooled Condensing Units (Counter-flow Type)—*1/3 to 5 hp. sizes*—For commercial and air conditioning work. Counter-flow condensers are efficient when water is free from salt or other mineral content.



Water-Cooled (Shell and Tube Type) **Condensing Units**—*3 hp. up to 30 tons capacity* — With cleanable condensers having removable heads.



Evaporative Condenser Receiver—*3 to 20 tons capacity*—Cleanable type and designed to provide economical means of condensing refrigerant vapors where high water rates and high water temperatures exist.

Floor Type Cooling Units—*1/2 to 1 1/2 tons capacity*—Attractive in appearance and efficient in operation. Made in two models—one for comfort cooling only, and one for complete air conditioning. The condensing unit is not part of the unit but must be placed in the basement or other convenient remote location.

Ceiling Type Comfort Unit—*3/4, 1 1/2 and 3 tons capacity*—Each unit is complete with filter, blower fan and efficient cooling unit. Can also be furnished for cold and hot water circulation.

Store and Office Cooler—*3 and 5 ton capacity*—A complete packaged air conditioning unit requiring only water and electrical connections to install. Cools, dehumidifies, circulates and filters the air. Adaptable for heating.

Air Conditioning and Refrigeration Equipment . . . . .

General Information About Curtis

93 models comprise the Curtis line of condensing units. There are 48 air-cooled units ranging in size from 1/6 to 5 hp., and 45 water-cooled units in sizes from 1/3 to 30 hp. All models are available for either Freon (F12) or Methyl Chloride.

Curtis units are designed especially for air conditioning, ice cream cabinets, refrigerated trucks, display cases with self-contained units, etc. Gasoline powered models and special designs also available.

Curtis also supplies a line of standard coils and forced draft unit coolers to balance Curtis condensing units.

Mechanical Features of Curtis Units

All Curtis compressors employ "Centro-Ring" positive pressure lubrication—an exclusive oiling system which has only one moving part—no gears or plunger. Other Curtis engineering refinements include:

Timken tapered roller bearings (all models above 3/4 hp.) . . . Positive pressure oiling system . . . Cylinder heads removable for valve inspection without breaking gas connections . . . Large valve areas . . . Drop forged, alloy steel, heat-treated crank-shaft and connecting rods . . . Individual correct displacement compressors for each motor size . . . Balanced sylphon bellows seal . . . Unusually large receivers and condensers assure maximum efficiency.

For dependable, economical air conditioning and refrigeration equipment, specify Curtis—and be sure of quality.

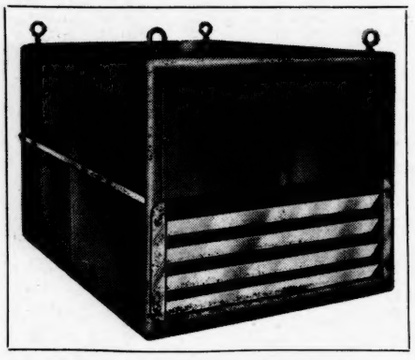
It will pay you to get all the facts about the complete Curtis line. Write to Curtis today.

CURTIS REFRIGERATION
AIR CONDITIONING COMMERCIAL

Curtis Refrigerating Machine Company

Division of Curtis Manufacturing Company—Established 1854

1999 Kienlen Avenue St. Louis, Mo.



Johnson Air Cooling Unit

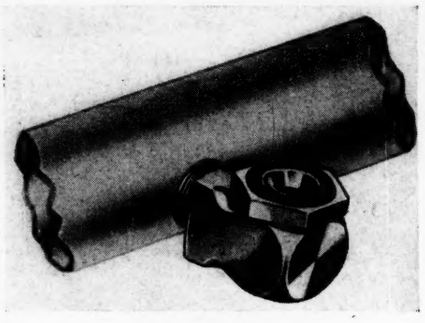
NAME—Health-aire-konditioner.
PURPOSE—For supplying cooled air for homes, offices and stores using cold water as a cooling medium.
FEATURES—This device consists of a specially designed water cooling coil, a high capacity quiet operating multi-blade fan which is connected by a V-belt drive to the motor, and a brown crackled finish housing. The units are designed for ceiling mounting. The amount of cooling is controlled by regulating the flow of water through the unit.
SIZES AND CAPACITIES—Six sizes with capacities ranging from 1 to 5 tons of refrigeration with a 60F water temperature. Air supplied ranges from 720 to 3490 c.f.m.
MADE BY—*Johnson Fan & Blower Corp., Chicago.* *11*

Chelsea Attic Fan

NAME—Chelsea attic fan.
PURPOSE—For cooling using night air.
FEATURES—Fan is constructed with a frame of welded steel and is designed so that it may be easily installed in walls or penthouses. It may also be used as a portable floor fan. Propeller is of three blade type designed to deliver a large volume of air at slow speed. Blades are riveted to a cast iron hub. Power is applied to shaft by means of grooved pulleys and a V-belt. Motor is rubber mounted to eliminate hum and vibration.
SIZES AND CAPACITIES—Four sizes ranging from 30 in. to 48 in. diameter with capacities of 5750 to 15,000 c.f.m.
MADE BY—*Chelsea Fan & Blower Co., Inc., New York.* *12*

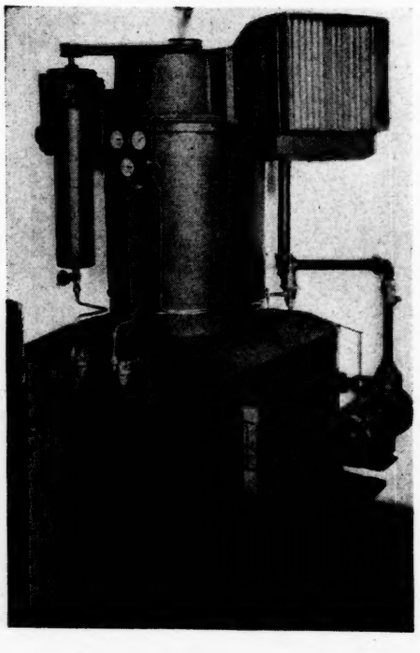
Spraying Systems Spray Nozzles

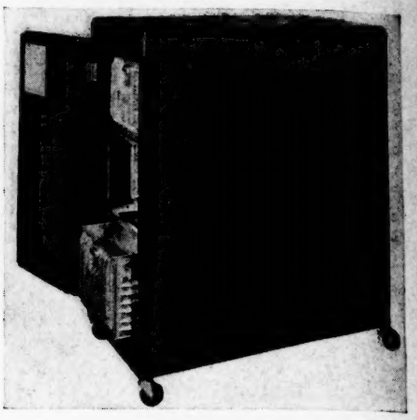
NAME—Whirljet.
PURPOSE—For roof cooling using city water or condenser cooling water.
FEATURES—Non-clogging with wide spray angle, giving wide coverage and a height spray less than the average parapet wall. It is stated that the cost of installation is low because of the small number of nozzles necessary and the small amount of water required to keep the roof moist.
SIZES—¼ in. male pipe connection, removable cap.
CAPACITIES—0.45 g.p.m. at 6 lb. pressure.
MADE BY—*Spraying Systems Co., Chicago, Ill.* *13*



Curtis Evaporative Condenser-Receiver

NAME — Evaporative condenser-receiver.
PURPOSE—To reduce cooling water consumption on air conditioning and commercial refrigeration installations.
FEATURES—Principal feature of this unit is the fact that it is cleanable in the same manner that a shell and tube condenser is cleanable. It is said to require only a small fan and pump motor due to the fact that it does not have spray nozzles and the total lift of the water is small. Unit is said to be very rugged because of its construction of cast iron and steel. No fin coil or fin tubing is used. The manufacturer states that a saving up to 95% of water consumption is obtained on some installations.
SIZES—From 3 to 20 hp.
MADE BY—*Curtis Refrigerating Machine Co,, St. Louis, Mo.* *14*





Industrial Room Cooler

NAME—Bruce room cooler.
PURPOSE—For room cooling using ice.
FEATURES—The cabinet is equipped with six heat exchangers (ice containers) over which the filtered air is forced. A motor-driven blower is used to circulate the air to the cooler. The air drawn from the room first passes through a filter and then into the fan. The fan forces the clean air over the corrugated surfaces of the ice containers and then out of the register at the top. The ice containers are so arranged that the air passes over them in series. A small amount of the cooled air is bypassed back to the fan through a beverage storage compartment. This makes it possible to use the cooler for cooling bottled drinks and drinking water. Ice storage capacity is 300 lb.
MADE BY—*Industrial Air Conditioning Co., Inc., Minneapolis, Minn.*....*15*

Westinghouse Store Air Conditioning Unit

NAME AND MODEL NUMBER—Unitaire SU-90 and SU-135.
PURPOSE—A self-contained air conditioning unit for summer air conditioning of small shops, stores, and offices.
FEATURES—The Unitaire can be located in almost any position in the room to be conditioned and occupies a space approximately 3 ft. wide, 2 ft. deep, and 8 ft. high. Connections required consist of a power outlet, water connection and drain. The unit can be adapted to winter air conditioning by installation of a heating coil and humidifier. Cabinet is finished in a brown crinkle enamel. Motor, compressor, and condenser are hermetically sealed. An adjustable thermostatic control is placed in the center of the cabinet. Two switches permit flexibility of operation, one controlling the cooling mechanism and the other the blower motor only.
SIZES AND CAPACITIES—Two sizes powered with 2½ or 3¼ hp. motors.
MADE BY—*Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.*.....*16*

WATCH KELVINATOR

From the Inside—

FOR THE NEXT QUARTER OF A CENTURY

THERE'S not much that air conditioning men miss . . . either looking backward over the history of their industry . . . or looking ahead.

And the fact that this year KELVINATOR celebrates its Silver Jubilee, spotlighting its major achievements in air-conditioning as well as in other fields, is influencing many "far-sighted" distributors to tie in for the *next* 25 years with a company that has *proved* it can "go places."

Balance these years of experience with Kelvinator's brilliantly successful record in dealing with distributor organizations, and you have a "go-ahead" team that can't be beat. Yet Kelvinator is no strong-arm organization. Kelvinator puts the pressure where it belongs: on helping the distributor to *sell,* rather than trying out shock-tactics to make him buy.

This emphasis-on-*sell* plan divides the selling process into its fundamental steps and sets up a *definite* procedure for the most efficient handling of each step. It puts the sale of commercial equipment on a Production Line basis. And the plan works. Figures show that the Kelvinator Sales Production Line kills waste motion, decreases costs and boosts efficiency of the retailing distributor.

Back of this "know-how" record stand the 7 strategically located Kelvinator Divisional offices; and 14 warehouses to simplify and speed up delivery of products.

Watch Kelvinator—from the inside! Just send the coupon for further "eye-opening" facts.

• • •

Kelvinator products for business include: Room Coolers and Store Air Conditioners, Central System air conditioning equipment — Automatic Heating equipment —Water Coolers— Beverage Coolers —Ice Cream Cabinets —Commercial Refrigeration Equipment.

KELVINATOR SILVER ANNIVERSARY 1914 1939

Kelvinator

AIR CONDITIONING AND AUTOMATIC HEATING

KELVINATOR, Division of Nash-Kelvinator Corporation, Dept. K-11 • Detroit, Michigan.

Gentlemen: No obligation, but I'd like the complete Kelvinator Franchise Story on:

☐ AIR CONDITIONING
☐ AUTOMATIC HEATING

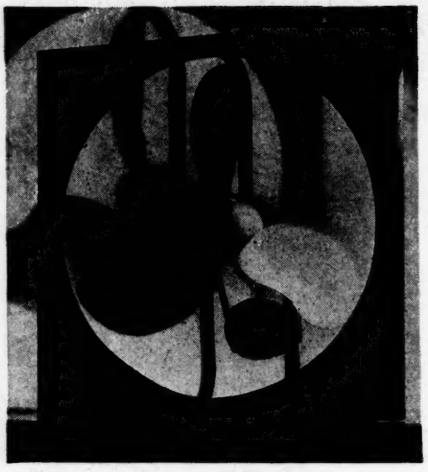
★

*Name*_____

*Firm Name*_____

*Street Address*_____

*City*_____ *State*_____

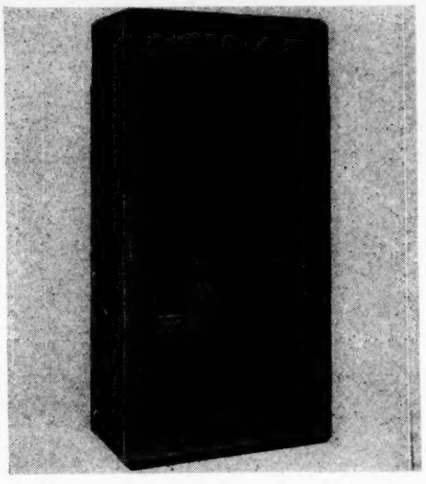


Viking Attic Fan

NAME—Viking CirCOOLator.
PURPOSE—For cooling by means of large volumes of night air.
FEATURES—The blade shape, pitch, number of blades and speed of the fan have been designed to make the fan inaudible when operated. All parts of the fan have been streamlined and the three supporting members are located well away from the fan blades so as not to interfere with the air flow. A streamline hub on the fan combines the bearing hub and fan pulley into one assembly. The bearing is concealed inside the assembly and turns around a shaft. This bearing is made of a special bronze which has the property of absorbing the oil and retaining it so that the fan might run for several weeks without lubrication if necessary.
SIZES AND CAPACITIES—Made in three sizes having capacities of 7500, 11,500 and 16,500 c.f.m., respectively. Modified design with larger motors and slightly higher speed is also available for commercial use.
MADE BY—*Viking Air Conditioning Corp., Cleveland, Ohio.* 17

Delco-Frigidaire Air Conditioning Unit

NAME—Three-ton Delco-Frigidaire air conditioner.
PURPOSE—For summer or year-round conditioning of retail establishments and other commercial applications.
FEATURES—The unit provides cooling, dehumidification, filtering and air circulation. A heating coil may be added as optional equipment to provide year-round utility. Unit is entirely self-contained, requiring only power, water and drain connections. It is said that the unit can be removed and reinstalled at a new location as a unit with full salvage value. Conditioned air is delivered from an acoustically insulated distribution hood at the top of the unit. Outlet is equipped with directional flow grilles to permit distribution of air to fit the requirements of the particular insulation. Where desired, the outlet flow may be omitted and the conditioner connected direct to the duct. Thermostatic control is provided as standard equipment. A 3-hp. water-cooled condensing unit is located in the lower section of the cabinet and the entire unit is isolated from the cabinet by means of a flexible rubber mounting. The compressor compartment is lined with a blanket of acoustic and heat insulating material. Heat generated within the compartment during operation is removed by a finned water coil, air circulation is within the compartment, being furnished by a fan built into the com-



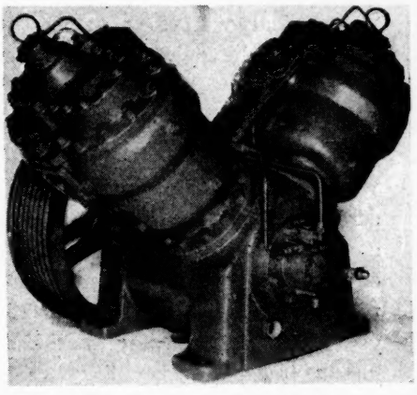
pressor flywheel. The upper section of the cabinet contains the filters, evaporator coil and fan. Freon is the refrigerant.
CAPACITY—Three tons.
MADE BY—*Delco-Frigidaire Conditioning Div., General Motors Sales Corp., Dayton, Ohio.* 18

Byron Jackson Deep Well Pump

NAME—Submersible deep well turbine pump.
PURPOSE—For pumping water from deep, shallow, crooked or straight wells, sumps or natural bodies of water.
FEATURES—This pump has its motor below and not above the turbine bowls as is usual practice. The propelling shaft is said to be very short and the long, small diameter motor operates submerged at all times in the well water. The liquid pumped does not come in contact with the electrical parts or bearings as these are enclosed in an oil-filled case with a mercury seal where the shaft passes through at the top. The turbine and the submersible motor form a unit that is attached to and supported by the discharge pipe. A submarine armored cable and small copper oil tube form the only connection aside from the discharge pipe between the pumping unit and the surface of the ground. Motor is of the squirrel cage induction type and its rotor is carried on two ball bearings. A high dielectric oil is circulated through the entire windings at all times.
MADE BY—*Byron Jackson Co., Los Angeles, Calif.* 19

Curtis Compressor

NAME—Curtis compressor.
PURPOSE — Compressor for methyl chloride or Freon air conditioning or commercial refrigeration installations.
FEATURES—Built-in automatic unloader and patented pressure lubrication.
SIZES—40 and 50 hp.
MADE BY—*Curtis Refrigerating Machine Co., St. Louis, Mo.* 20



TO OBTAIN FURTHER INFORMATION ON 1938 NEW EQUIPMENT FOR SUMMER USE

On the list below circle the item number of the equipment in which you are interested, using the number found at the end of each item.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

(This service available only to engineers or executives)

Fill in your name and address, detach and mail to
HEATING & VENTILATING, 148 Lafayette St., New York, N. Y.

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Firm .....
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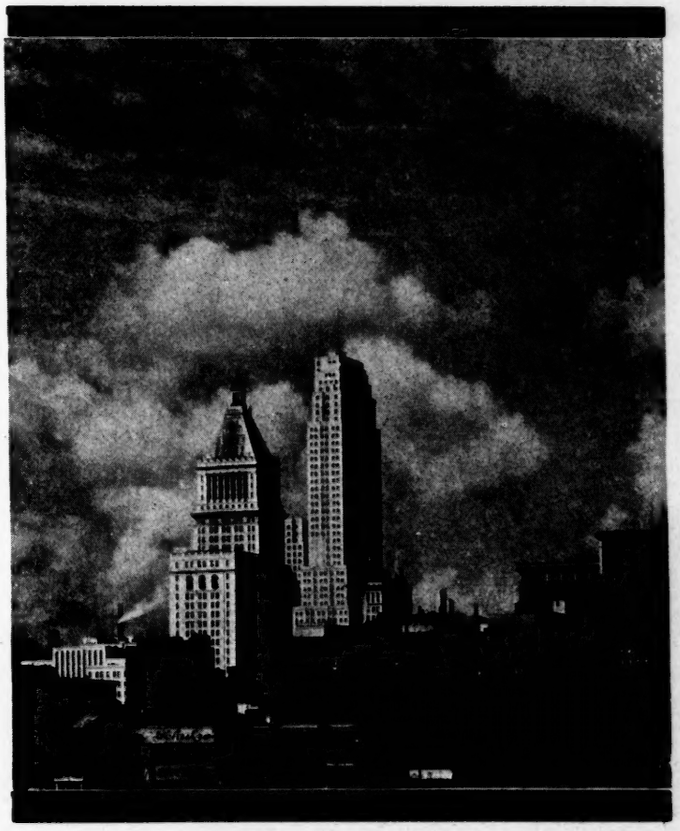
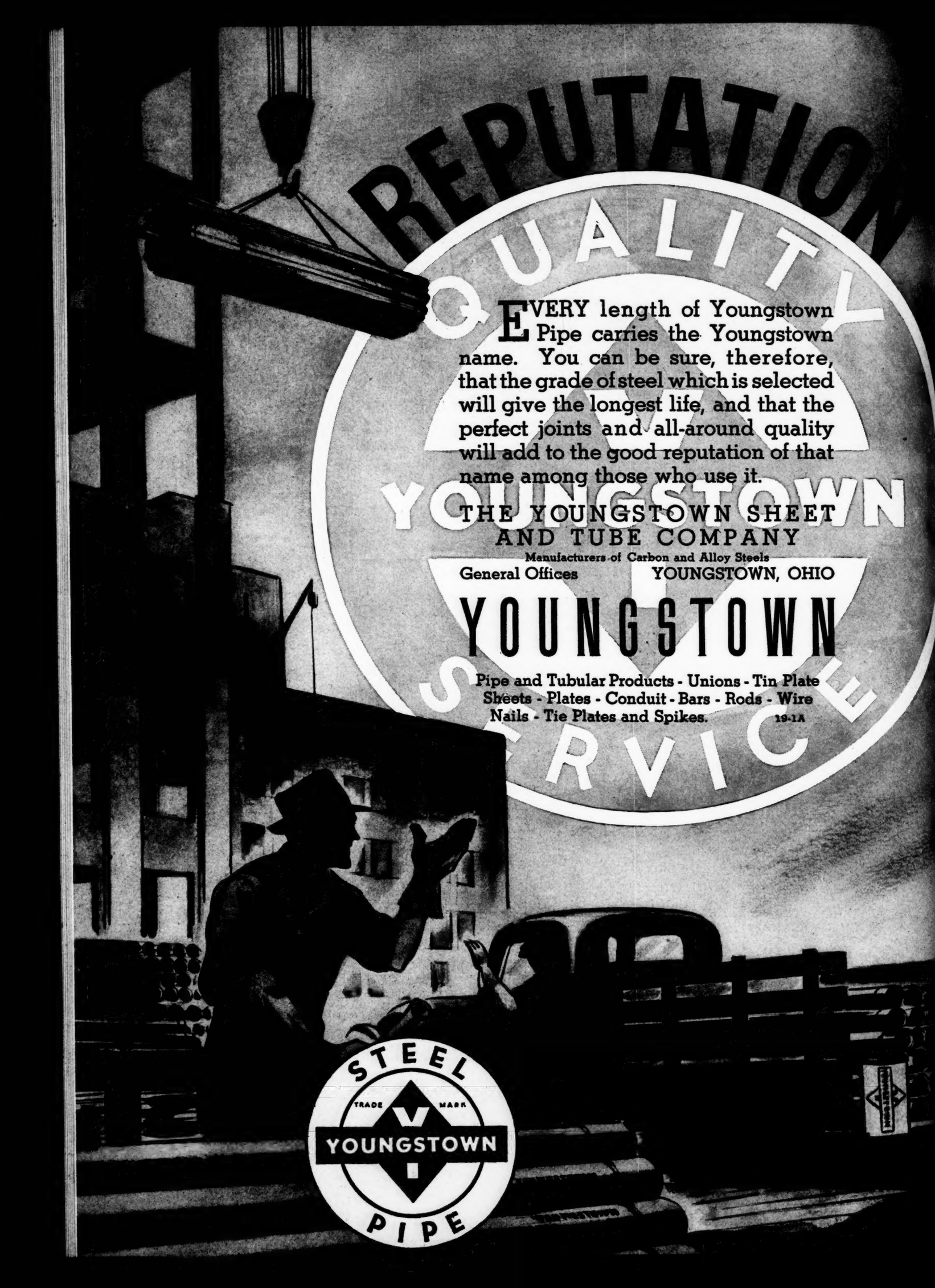


YEAR 'ROUND SECTION

Pages 88 to 111


REPUTATION
QUALITY
EVERY length of Youngstown Pipe carries the Youngstown name. You can be sure, therefore, that the grade of steel which is selected will give the longest life, and that the perfect joints and all-around quality will add to the good reputation of that name among those who use it.
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Nails - Tie Plates and Spikes. 19-1A
SERVICE
STEEL
TRADE MARK
YOUNGSTOWN
PIPE

Air Flow and Purification, Moisture in Insulation Emphasized During 1938

Year Round

IN this section are to be found those topics not readily identified as belonging in summer or winter and including air distribution and cleaning.

Statistical information on the equipment used is not in good shape because so much of it is either not reported at all or else is reported in such a fashion that the amounts going for use in heating and ventilation work can not be determined.

Subjects which properly belong in this section and in which there were interesting developments during 1938 include metal fastening and joining, corrosion, water treatment, development of standards and codes, and the interesting changes in practice in connection with the erection of piping. However, the topics discussed here have seemed to demand space for their presentation to such an extent that these others have had to be omitted and put on a calendar for presentation in coming issues.

Statistics

The statistical side of year-round equipment sales can be summed up in one sentence: Total 1938 sales of year-round equipment for which figures are available indicate a drop of 30% from 1937.

Fans and blowers are sold for uses other than air conditioning and ventilation, and consequently the figures and curves presented here do not purport to show total fan and blower business but, following our practice of other years, show only sales of this equipment for heating and ventilating work. Sales data on fans and blowers sold for mechanical draft and for general industrial use have not been included, although undoubtedly some part of such sales are through heating and air conditioning distribution channels and for heating or ventilating work.

The following table condenses the information on 1938 sales (10 months) relative to 1937 for the fan and blower group considered as heating or air conditioning products:

Equipment	Per Cent Change From 1937
Large blowers for ventilating	—11
Small-housed blowers	—22
Propeller fans	—29
Motors sold separately	— 9
Total	—21

These figures are all based on the dollar volume of sales. Since there are no published or available data on price trends in connection with fans and blowers there is no way of telling just what the physical volume of sales was in terms of horsepower or numbers.

Sales of air washers declined sharply in ten months of 1938 from the corresponding period in 1937, the drop being 55%.

Collection of statistics on air filters was only begun by the Department of Commerce in 1936. Figures for the first ten months of 1938 indicate that total sales for 1938 of these devices by reporting manufacturers will be in the neighborhood of $352,000 as compared with $391,000, a loss of about 10%. This drop is of the same order of that in ventilating blower sales which were off 11%.

Reports on sales of indirect heating surface (heat transfer surface) indicate that total 1938 sales of this type of equipment fell off nearly 50% as compared with the previous year. The total is made up of steel surface, cast iron surface, and non-ferrous surface, all of which suffered losses in sales.

Industrial Air Purification

Interest in industrial air-borne diseases and their prevention continued during all of 1938 following the revival which came about in late 1937 and early 1938 due to the recognition of the silicosis hazard and the conferences and legal steps taken in connection with it.

Late in the year Emmons and Fries published the results of their studies with aluminum as a means of preventing silicosis when mixed with dusty air. They attempted to analyze the reason for the effects and concluded that aluminum should be regarded as in a class with other mineral substances known to be effective. No further results of attempts to actually put aluminum to practical use in dusty atmospheres were noted during the year.

In New York, studies made under the direction of Dr. Leonard Greenburg were published early in the year. They indicated that silicosis among New York foundry workers was not so extensive but that it could be expected to yield satisfactorily to control. Great variations in the character of the problem were found in the surveyed foundries. Similar surveys in other dusty industries in New York are planned but reports did not appear during 1938.

Methods of determining quartz dust in air are necessary to an accurate study of silicosis and Knopf writing in Public Health Reports of the U. S. Public Health Service reviewed the methods and brought the subject up to date late in 1937. In these same reports Page presented the results of a study of workers in asbestos

plants and indicated how the problem is being handled in one of the dusty industries. During the year too Foster and Schrenk through the U. S. Bureau of Mines reported their studies of the methods of identifying atmospheric dust particles.

Interest in dust and fume prevention and control in industry was widespread during 1938. Evidence of this is found in the fact that in Massachusetts a committee was formed during the year to draft suitable codes for that state. Also American Standards Association authorized a committee on exhaust ventilation to develop standards for safe limits of concentration of dusts and gases in the air. It is expected that the actual preparation of suitable standards will be a slow process as it is anticipated that much research work will be necessary.

Studies were not confined to this country for during the year Browning, through the British Medical Research Council, published a summary of what is known concerning the toxicity in air of a large number of industrial solvents. Later in the year a publication of the Department of Scientific and Industrial Research of Great Britain appeared in which methods of testing air for the presence of the deadly hydrogen cyanide were described.

Notable activities of the year were reported at the November meeting of Air Hygiene Foundation, the employers' organization. Researches are being conducted under grants from the foundation at Harvard School of Public Health, University of Pennsylvania, The Saranac Laboratory, and Mellon Institute, headquarters of the Foundation.

Prof. Philip Drinker, chairman of the Preventive Engineering Committee, reported:

"Two graduate fellowships have been established by Air Hygiene Foundation at Harvard University to train men in industrial hygiene. This will help build up a skilled personnel to meet increasing demands from industry and government for industrial hygienists. One candidate will study fundamentals of hood design for control of gases, vapors, etc., where low air velocities are permissible. The other fellowship will study the identification and distribution of dusts in tissue.

"During 1938 the Preventive Engineering Committee issued seven bulletins covering practical measures for combating industrial health problems. The bulletins are: Determination of Benzol Vapor in the Atmosphere, Use and Care of Respirators, Determination of Chlorinated Hydro-carbon Vapor, Design of Exhaust Hoods, Design of Ductwork for Exhaust Systems, Determination of Lead in the Air, and Identification of Industrial Dust. The question of 'What is the best apparatus and method for dust determination?' is still about where it was a year ago.

"The Bureau of Mines showed that the impinger is inefficient for collecting lead fumes in air and suggests the use of an electrical precipitator. The Bureau described a midget impinger which is run at a few liters of air per minute, instead of 1 cu. ft. (28.3 liters). This equipment, very light and entirely hand operable, may gradually replace the large impinger, particularly for work in mines. The various grab samplers are useful, particularly for routine control.

"There is great need for a critical survey of design and operation of existing exhaust systems in industry. Such a study would bring out fundamental requirements of design, particularly with respect to air velocities through hoods, transporting velocities, etc. Past experience needs to be studied critically in order to provide a basis for future design. The Committee recommends that a full-time fellowship be established to make such a study."

Dr. Leroy U. Gardner, director, The Saranac (N. Y.) Laboratory, reported findings in a study of "mixed" dusts and "protector" dusts which he is conducting under a grant from the Foundation. His investigations show that the mixing of certain inert dust with quartz seems to retard incidence of silicosis.

Dr. S. Reid Warren, Jr., of University of Pennsylvania, reported on research on X-ray which is being supported by the Foundation and which seeks to improve the X-ray technique for industrial purposes, as in the case of large-scale medical examinations of groups of workmen. He and his associates experimented in taking X-ray pictures on paper, much cheaper than film. This work will "prepare the groundwork for a standardization of roentgenographic procedure in industry."

Dr. H. B. Meller, managing director of the Foundation, announced that a number of industrial hygiene surveys were made for member companies.

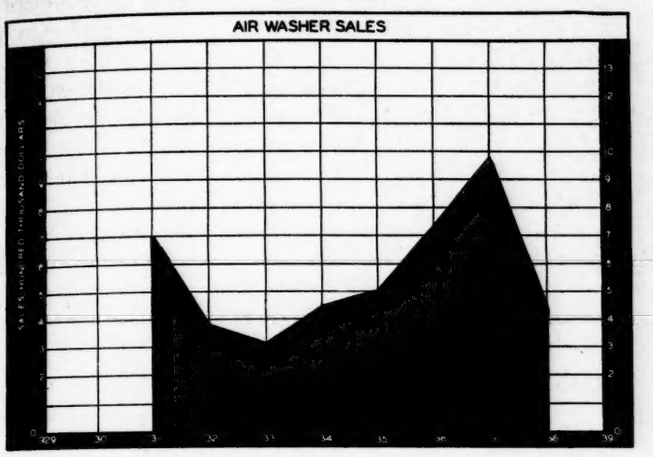
Odor and Dirt Removal from Air

Little activity was reported during the year in connection with the problem of odors in air. The minimum of 10 cu. ft. per person per minute is still accepted *as a minimum* but there is a marked tendency toward arrangement of air conditioning installations so that flushing with large volumes of air can be practiced at least periodically even if most of the air is recirculated during periods of peak load. Removal of odors by dilution rather than by extraction through other means continued to be the general practice in spite of the availability of odor filters. What reports of studies on the odor problem came to attention were more concerned with determining the nature of odors and the mechanism of their perception rather than with direct application to air conditioning. The very fact that study is being directed at the nature of odors can be taken as showing a renewal of interest in the subject which may result in engineering information as time goes on.

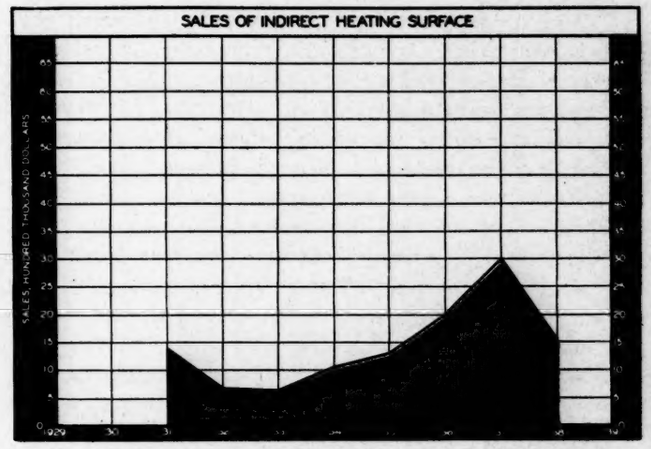
The special problem of providing pollen-free air for hay fever and asthma sufferers has been so fully examined that no reports of new findings on the subject appeared during the year. The procedure and equipment have become routine and standard to such an extent that their use in indicated cases is now commonplace.

Air cleaning methods and devices for general purpose application underwent no marked changes during the year. Early installations of electrical precipitation cleaners were reported. Development of a testing and performance program at the Bureau of Standards renewed interest in test methods for filters about which there has long been difference of opinion.

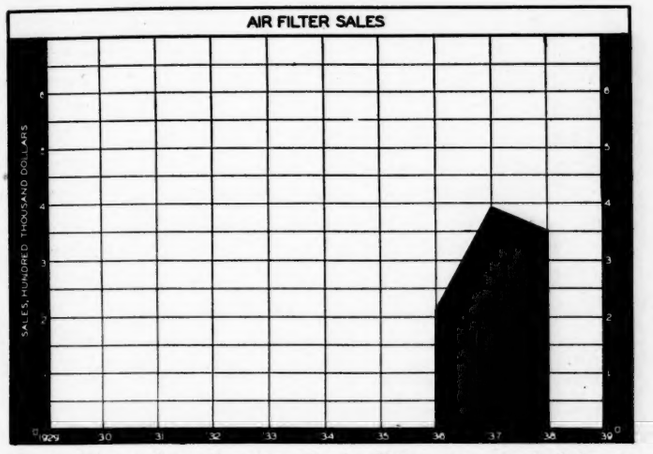
ANNUAL SALES



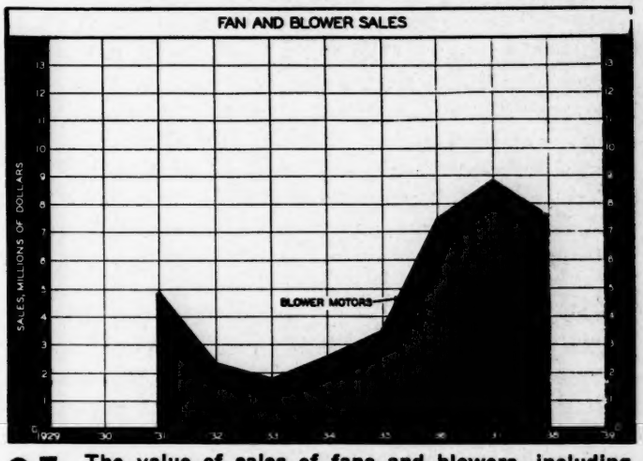
32 The value of sales of air washers as reported by a number of manufacturers. The figures are in terms of orders booked. Data not available prior to 1931.



33 Value of sales of indirect heating (and cooling) surface, including steel, cast iron, and non-ferrous types of surfaces. Figures are in terms of new orders.



34 The value of sales of air filters as reported by a number of manufacturers. Figures are in terms of new orders. Data not available prior to the year 1936.



35 The value of sales of fans and blowers, including fans used for ventilating public buildings, small housed blowers, propeller fans, and motors sold separately.

Bacteria in Air

In the past two January issues of HEATING & VENTILATING reference has been made to the work of William F. Wells on the subject of air-borne infection. He has shown that minute droplets containing micro-organisms evaporate when projected into air, and the contained organisms remain suspended alive for some time, may drift in air currents, and may be planted on the respiratory tract of others. Thus he has demonstrated the possibility of air-borne infection through droplet nuclei.

He has developed, further, equipment for testing purposes, whereby a diluted culture of a test organism may be thrown into the air by an atomizer, acting as a mechanical infector. An air centrifuge determines the bacterial concentration. These two pieces of equipment form the basis of a test method for measuring the rate at which micro-organisms are vented or eliminated from the air. He has shown, moreover, that by the use of this testing equipment replacement of the confined air by outside air or air from other parts of the building by natural or artificial means, or removal or destruction of micro-organisms within the air, all can be expressed in terms of equivalent ventilation.

Simple mathematical computation reduces the test data to terms of equivalent air changes per hour, units with which engineers commonly work. Wells, in a paper read before the American Public Health Association, October, 1938, stated: "The importance of distinguishing between the hygienic potentialities of bacterial ventilation by air displacement and by other means of disinfecting habited atmospheres has become evident from analysis of some 1,750 air samples, collected in studies to be reported later. During the winter months, associated with the spread of respiratory infections, when the closing of doors, windows or other natural vents confines the air commonly breathed by many persons, natural ventilation rates fall below ten overturns per hour. To double air replacements, during cold weather, by mechanical or window ventilation raises practical difficulties, and has led to no conspicuous decline in respiratory diseases. With the opening of windows in the spring such infections consistently decline, with ventilation rates approaching a hundred overturns per hour. Whether equivalent bacterial ventilation by air disinfection during the winter can accomplish similar hygienic results is an important problem in sanitary science." He has set tentative experimental equivalent ventilation standards of 100 overturns per hour (by this method) in schoolrooms. He obtained very much higher values under favorable conditions.

Apparently Wells' work has reached a point where he can suggest a tentative scale for sanitary ventilation. It is based on observations ranging all the way from closed-up winter conditions with the likelihood of airborne infection, to wide open summer conditions, or perhaps conditions of ultra-violet sterilization where the sanitary condition of the air should be excellent.

By using this scale as a measure of sanitary ventilation Wells found some interesting practical conditions and limitations under which he was able to secure adequate values. The equivalent sanitary ventilation obtainable by irradiation of recirculated air is limited by the rate of recirculation. If only 10% of the air is recirculated per minute, the highest equivalent ventilation by any system of purification or by supplying entirely fresh outside air would be six changes per hour. It is thus clear that the best results possible by this method are very much less than those obtained when direct irradiation of all the air can be practiced. Direct ultra-violet radiation is unfortunately not always practicable, because people's eyes must be protected from excessive exposure, but in hospital operating rooms the necessary precautions can be insisted upon. Indirect radiation in schoolrooms has, however, given values higher than obtained by opening all windows.

Further experimental work will be necessary to establish sound design standards and before installation technique for general application of ultra-violet radiation for sanitary ventilation can be practiced.

The Noise Problem

That phase of the noise problem which has to do with keeping noise originating in equipment below the levels present without the equipment is now well enough in hand so that methods of prevention are fairly well standardized. There is still no general agreement on the details of how the noise problem shall be solved, but empirical methods have progressed to a point where the worst of the practical problems can be handled. Prepared mountings for electric motors are commonly built in. Foundation mats are rather readily proportioned. While new equipment for this purpose continued to appear it generally represented improvements in design and materials rather than in new methods.

Rating of equipment for sound levels with published ratings as an item of performance data is not yet general. A few types of equipment, notably unit heaters, continue the practice but the year saw no particular extension. Testing and rating methods are still under discussion while suitably equipped laboratories for such purposes are scarce.

Equipment, such as unit coolers and self-contained cabinet air conditioners, which is located in occupied rooms presents a difficult problem in noise prevention. The present method consists of eliminating as much noise as possible by careful balancing, streamlining, use of as moderate speeds as possible, elastic mounting of motors, fan and compressors. Sound insulating material is then placed on the inside of the jacket surrounding the moving parts. The increase in the upper limits of size and horsepower of these units during the year was to some extent made possible because of progress in solving the noise problem.

During the year a report of the Committee on Air Conditioning of the American Medical Association published a report on the effects of noise on human beings. This report summarized much of the experimental evidence on noise as it affects people. The report indicates that a noise level of 90 decibels or higher is harmful to the ear, that high pitched sound is generally more dangerous than low pitched sound, that reduction in sound level of 12 to 15 decibels has produced instances where measurable increase in work output has resulted. When the use of air conditioning leads to the closing of windows and doors the committee considered that reduction of noise level may range from 5 to 30 decibels and that this may easily represent a reduction of 45 to 55% in noise.

Air Distribution

For some time the data for determining pressure losses in ducts have been in an unsatisfactory state. During the year a report of studies made at the University of Illinois by Professor Kratz shed some light on this subject as it dealt with the losses due to changes in cross section. From experiment it was shown that small angles of divergence and convergence are desirable, with a minimum loss when the angle is about 7°. During the year, too, a research study at the ASHVE laboratory on the friction losses of air flowing in straight ducts was substantially completed and some work was done on losses in elbows and fittings. Additional research work is in progress at Illinois on the problem of air friction at outlets. While there was thus but little actual progress during the year so far as applicable results are concerned, study projects are organized and expected to result in data which should greatly aid in the design of ducts for pressure loss.

During the year fabricated ducts of asbestos appeared on the market as did additional ones of sheet metal. Generally the trend toward use of fabricated ducts on small installations continued during the year.

Many new products for directing and controlling air flow into and out of rooms appeared during the year both for side wall and ceiling location. The ceiling outlets usually provide for mixing of conditioned and room air at the fixture before directing it into the room. On cooling installations there seems to be a definite trend toward use of these devices and this method of air diffusion. Winter installations continue largely to use side wall outlets and inlets but the distribution of the released air is controlled as to direction much more generally than formerly by the use of adjustable louvers built into the device. Some designs also permit volume adjustment. Throughout the year the trend continued toward putting in the hands of users improved performance data regarding air outlet and distribution devices generally. As a result the applier can now much more readily than ever before determine the throw, the dip of the air stream, the frictional resistance and the volume of air which can be handled by air grilles, registers and outlet fixtures.

Development of fully adjustable outlet devices also contributed to another trend which is toward elimination of ductwork when possible in commercial air cooling for existing stores and small offices by the use of room units. Ability to direct, control and adjust the air stream from such units makes it possible to put

them into locations formerly not considered suitable.

During the year, too, it was announced that studies to determine the best location in a room for the air outlets were being undertaken at the University of Wisconsin. Studies expected to have an eventual bearing on air distribution are also in progress at the ASHVE laboratory where drafts are being investigated. Preliminary reports on this study appeared during the year.

Heat Transmission

Heat transmission is so basic a subject that any advances either immediately or eventually affect practice. During the year there were a number of developments of which only a few can be noted here.

For the first time the heat transfer coefficients present when liquids boil in tubes and pass heat through the tube to the surrounding air were studied over a considerable range of temperatures. It was found that these coefficients do not increase regularly with increase in temperature differences as supposed.

The performance of finned tube coils when exposed to air streams has been repeatedly analyzed and tabulated for use throughout the industry. This has been true of such coils both when passing heat to the air stream and when receiving heat from the air as in summer operation. While performance of specific equipment could thus be established, designers of such coils had but little data on which to proceed, and testing methods were tedious. During the year as a result of studies under the direction of Professor Tuve at Case, a method of greatly simplified performance testing was reported. If fully confirmed this should make this particular problem of heat transfer much more workable.

During the year Eddy and Nelson published results of studies of the surface emissivities of bare concrete and of the several finishes commonly used on the interior walls of room. Their values agree reasonably closely with those reported by earlier investigation.

For a long time there has been no agreement on suitable standards for measuring the heat conductivity of materials. A large number of testing methods are in existence and even those which follow like principles frequently differ from each other in details of procedure. During the year a joint committee of various groups interested in establishing a standard test method was organized under the procedure of ASTM. F. C. Houghten was designated chairman and it is expected that a standard method of test and measurement will result.

One phase of heat transmission in which interest never lags is that of the heat which passes through materials and constructions used in building work.

The announcement made during the year that the Bureau of Standards would study building insulation commanded close attention. The testing and research program outlined was one of the most comprehensive ever announced by any agency and when completed should fill up many gaps and answer some much-discussed and presently opinionated questions. It was announced that the Bureau would attempt to provide data on materials and constructions where such data are now missing or conflicting, and that the subject of the effect of moisture on the insulating properties of materials would be investigated. The study would also attempt to determine the validity of the opinion held in some quarters that the thermal conductance of fill materials in "full-wall thickness" (3½ to 4 in.) is considerably less than would be calculated from tests on a 1-in. thickness. Measurements would be made on a number of walls whose properties have not been fully investigated such as walls containing steel studs. Tests on reflective types of insulation would be made and it was planned to put the data on these materials into better form for ready use. Included in the program also were tests to determine the effect of water on the thermal insulation properties of various materials.

This subject of water in insulating materials was an especially live one throughout 1938. For some time field reports had persisted that moisture was a nuisance on walls and ceilings in some insulated residences in the colder cities. It was suspected that the trouble was due to use of insulation materials in the buildings although the actual cause was a subject of much dispute because of the high humidities sometimes maintained inside. So also was it alleged that ice formed in cold weather in the insulating material itself and caused various troubles. Here again the real cause and even the existence of the condition were disputed. At any rate the situation attracted enough attention so that laboratories were equipped to study the subject thoroughly. Analysis of the temperature and pressure gradients through various constructions appeared. Studies were made of the nature of the process of moisture flow and ice formation in insulating materials. It was pointed out that several steps might be taken to improve conditions. One was to vent the construction, another was to use effective moisture barriers, and a third was to maintain greatly reduced humidities inside the building. Throughout the year, too, studies in laboratories were continued and it was predicted that eventually enough may be known about the moisture effect on insulating materials so that data on heat flow through moist or wet materials may be estimated by methods similar to those now used for dry materials. Moreover it is to be expected that improved methods of moisture exclusion and of construction will be developed. With things as they were it was reported that the sales of certain building insulation materials were greatly curtailed in 1938.

While the question of the effects of moisture on insulating materials was thus being agitated and discussed in this country with several plans and programs under way, reports of some work on heat transmission appeared in British publications. The test method used exposes the wall to the actual weather and it thus may become wet or dry from time to time depending on weather conditions. While the results of this work are far from conclusive the reports do show that coefficients of transmission in the colder months are considerably greater than in the spring and fall months. It was also stated during the year that British studies on the effect of moisture on the thermal resistance of wallboard showed that the effect was not serious and that a large change occurs only when wallboard is persistently wetted. To what extent these results are confirmed by the anticipated American findings should be known during the coming months.

YEAR-ROUND EQUIPMENT

29 Blowers for Public Building Ventilation

Orders, Dollars

	1935	1936	1937	1938
Jan	60,571	88,308	130,765	88,209
Feb	29,181	105,753	134,643	245,710
Mar	73,023	178,453	200,310	184,460
Apr	112,226	195,756	287,135	169,769
May	109,330	160,342	212,237	178,963
Jun	111,716	135,831	197,762	171,471
Jul	81,218	139,386	138,423	99,476
Aug	64,883	140,345	168,248	157,591
Sep	67,322	133,362	135,137	86,765
Oct	62,889	147,963	110,867	140,097
Nov	136,496	128,935	103,082	—
Dec	90,836	103,770	103,975	—
YEAR	999,691	1,658,204	1,922,584	—

30 Small Housed Blowers (Merchandise Units)

Orders, Dollars

	1935	1936	1937	1938
Jan	42,070	104,708	146,223	132,776
Feb	42,977	65,687	135,289	96,840
Mar	49,289	67,638	143,084	88,972
Apr	43,425	99,391	157,835	90,942
May	48,866	120,943	150,592	141,337
Jun	48,872	149,068	162,736	178,931
Jul	58,285	146,627	196,997	145,108
Aug	57,277	162,243	163,555	155,991
Sept	51,267	155,310	219,878	131,479
Oct	62,723	147,051	169,942	125,701
Nov	51,205	139,297	139,178	—
Dec	69,381	120,451	110,389	—
YEAR	625,637	1,478,414	1,896,318	—

31 Propeller Type Fans, Ventilation

Orders, Dollars

	1935	1936	1937	1938
Jan	50,670	77,359	229,443	162,368
Feb	61,110	136,360	201,150	136,418
Mar	67,708	169,410	236,949	225,166
Apr	88,879	225,890	322,442	261,441
May	124,118	366,804	402,332	305,789
Jun	165,114	395,053	645,301	347,108
Jul	217,368	600,534	579,255	343,898
Aug	128,196	332,278	354,013	288,603
Sep	68,043	284,428	338,788	263,807
Oct	86,102	280,346	283,850	220,080
Nov	120,937	393,234	276,413	—
Dec	91,502	200,712	191,376	—
YEAR	1,269,747	3,462,408	4,061,212	—

32 Fan and Blower Motors Sold Separately

Orders, Dollars

	1935	1936	1937	1938
Jan	42,762	48,560	73,546	33,309
Feb	45,210	55,926	59,870	146,582
Mar	37,447	69,849	90,046	123,351
Apr	43,505	84,274	176,566	60,939
May	37,679	63,324	85,010	60,197
Jun	67,137	80,639	112,380	55,743
Jul	35,645	85,248	90,032	68,862
Aug	44,739	72,293	64,240	140,558
Sep	41,281	62,102	66,162	36,014
Oct	43,873	132,074	68,776	83,634
Nov	112,485	78,577	62,520	—
Dec	55,583	61,567	61,945	—
YEAR	607,346	894,433	1,011,093	—

33 Total Fan and Blower Business

Total, Tables 29-32, Incl., Dollars

	1935	1936	1937	1938
Jan	196,073	318,935	579,977	416,662
Feb	180,504	363,726	530,952	625,550
Mar	227,467	485,350	670,389	621,949
Apr	288,035	605,311	943,978	583,091
May	319,993	711,413	850,171	686,286
Jun	392,839	760,591	1,118,179	753,253
Jul	356,871	971,795	1,004,707	657,344
Aug	295,095	707,159	750,056	742,743
Sep	227,913	635,202	759,965	518,065
Oct	255,587	707,434	633,435	569,512
Nov	421,123	740,043	581,813	—
Dec	307,302	486,500	467,685	—
YEAR	3,502,421	7,493,459	8,891,207	—

34 Indirect Heating Surface, All Types

Orders, Dollars

	1935	1936	1937	1938
Jan	84,990	109,051	257,136	101,319
Feb	70,571	132,484	221,426	106,943
Mar	79,811	168,426	352,549	144,530
Apr	133,057	174,488	395,064	133,072
May	112,367	135,247	247,610	117,256
Jun	114,657	158,860	266,111	161,027
Jul	96,023	158,440	229,144	155,546
Aug	139,843	167,752	274,340	147,294
Sept	102,879	177,748	247,885	104,812
Oct	119,163	170,874	163,432	138,954
Nov	129,981	229,952	157,509	—
Dec	117,626	234,873	192,560	—
YEAR	1,301,018	2,018,195	3,004,766	—

35 Air Washers for Central Systems

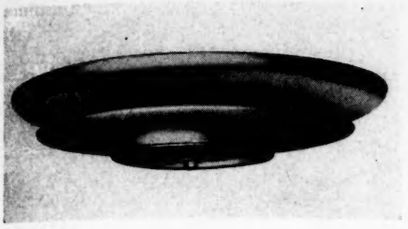
Orders, Dollars

	1935	1936	1937	1938
Jan	20,369	39,357	75,350	30,470
Feb	39,685	39,746	37,595	46,855
Mar	49,251	71,673	146,612	42,310
Apr	56,009	79,160	109,642	57,314
May	57,644	84,402	119,987	50,445
Jun	58,614	87,970	115,335	39,566
Jul	24,350	65,738	66,537	37,460
Aug	30,320	51,916	81,460	45,054
Sep	14,870	36,217	80,925	17,088
Oct	26,358	57,247	41,235	26,617
Nov	108,856	50,292	49,893	—
Dec	22,025	76,633	51,565	—
YEAR	508,351	740,351	976,136	—

36 Air Filters, All Types

Orders, Dollars

	1935	1936	1937	1938
Jan	—	17,634	17,242	24,878
Feb	—	15,213	20,747	19,527
Mar	—	43,701	34,542	20,797
Apr	—	19,137	53,388	37,340
May	—	21,363	38,673	30,391
Jun	—	12,430	41,290	34,951
Jul	—	11,648	37,185	35,937
Aug	—	11,531	32,937	39,855
Sep	—	14,952	42,841	39,374
Oct	—	23,745	36,815	35,622
Nov	—	9,795	19,084	—
Dec	—	9,294	16,464	—
YEAR	—	210,443	391,208	—



Barber-Colman Ceiling Outlet

NAME—Venturi-Flo.
PURPOSE—A ceiling outlet designed to properly mix conditioned air and room air and distribute the mixture.
FEATURES—This outlet, which is constructed entirely of stamped or spun steel, is made up of a ceiling plate assembly and a diffuser assembly. Supply air enters the unit from a duct and flows outward through a venturi opening. The supply air in passing through the venturi opening draws some of the room air into the opening and a mixing action occurs. The mixture is then distributed sidewise in all directions. The manufacturer states that in performance the Venturi-Flo has a lower pressure drop and noise level than usual outlets and that the air distribution is uniform and free from drafts. The size of the veturi opening may be adjusted to provide for different capacities and throws.
SIZES AND CAPACITIES—Made in 32 in. size at present; two other sizes, one larger and one smaller, available in the near future. Capacities range from 275 c.f.m., with a 4-ft. throw and 1-in. venturi opening, to 2300 c.f.m., with a 20-ft. throw and 3-in. venturi opening when installed in a room with an 8 ft. 6 in. ceiling. Increased capacities possible with greater ceiling heights.
MADE BY—*Barber-Colman Co., Rockford, Ill.* *1*

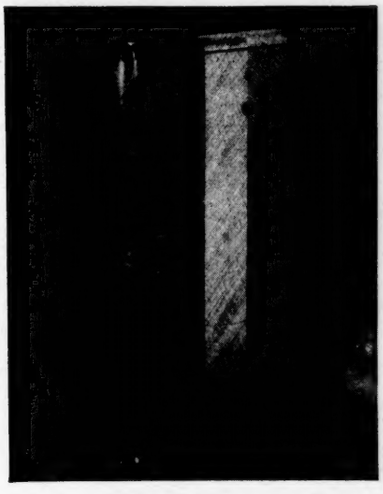
Sturtevant Unit Ventilator

NAME—Auditorium unit ventilator.
PURPOSE—A large capacity unit ventilator for heating and ventilating auditoriums, gymnasiums, assembly halls, and similar large interiors.
FEATURES—Unit consists of an inlet, filter, fan, heater and discharge outlet. Entire assembly is enclosed in a duco finished furniture steel casing. Fresh or recirculated air is drawn through the unit by means of a motor-driven fan located inside the casing. The air passes through a filter and heater and is introduced into the room free from dust and heated to the required temperature. Filters supplied are either of the dry or oil filter type. Units can be installed either horizontally or vertically and can be mounted on the wall or ceiling. Grilles or duct connections

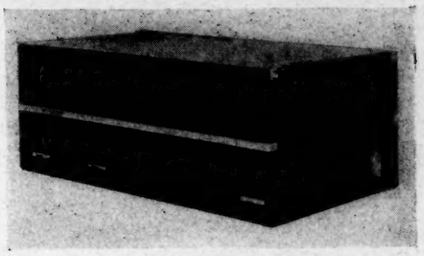
on either intake or discharge ends can be supplied if desired.
LITERATURE AVAILABLE—Catalog Supplement No. 377-1.
MADE BY—*B. F. Sturtevant Co., Hyde Park, Boston, Mass.* *2*

Westinghouse Air Cleaner

NAME — Portable electrostatic air cleaner.
PURPOSE—A portable air cleaner designed especially for the relief of hay fever and pollen-asthma sufferers but also applicable for general air cleaning in average sized rooms.



FEATURES—Unit depends for its operation upon the cleaning action on gases of a corona discharge. Dirt particles and foreign matter in the air are charged in an ionizing section and then precipitated on the charged plates of the dirt collector cell. Cleaning of the collector cell is accomplished by washing about once every six weeks. Unit may be adjusted to draw in outside air or recirculate the air. Bears approval of Underwriters' Laboratories and the Council on Physical Therapy of the American Medical Association. It is free from radio interference.
SIZES AND CAPACITIES—Operates from 115-volt outlet drawing approximately 80 watts, and circulates 240 c.f.m.
MADE BY—*Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.* *3*



Modine Air Conditioner

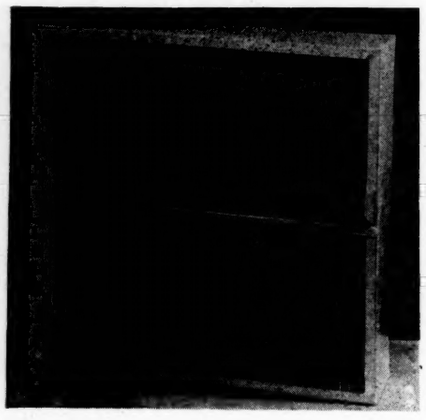
NAME AND MODEL NUMBERS—Apartment house type air conditioners, models 74 and 155.
PURPOSE—A year-round air conditioner for apartments, stores, and residences.
FEATURES—Access doors to the motor, blower, control panel, water valves, heating and cooling coils and humidifying trays are on one side of the unit. All piping and conduit connections are likewise made from this same side. The overall height of the conditioner is 18 in. and the motor and motor drive are completely enclosed in the cabinet. The manufacturer states that because of the above features the Modine unit can be installed with only one side exposed. The rest of the cabinet may be installed flush with the adjoining surfaces. Unit requires connections to hot water or steam heating system and cold water or refrigerant line, as well as to electric lines and a drain.
CAPACITIES — Model 74 heating capacity 74,000 B.t.u. per hr. with 2 lb. steam and cooling capacity 27,300 B.t.u. per hr. with 45F water. Model 155 heating capacity 155,000 B.t.u. per hr. with 2 lb. steam and a cooling capacity 57,500 B.t.u. per hr. with 45F water.
LITERATURE AVAILABLE — Bulletin 638.
MADE BY—*Modine Manufacturing Co., Racine, Wis.* *4*

Torrington Flexible Coupling

NAME—Torrington flexible coupling.
PURPOSE—A spline type flexible coupling for use in gun-type oil burners.
FEATURES — The sleeve end of the coupling is a sliding fit on the wheel hub and when assembled covers the hub set screw, preventing this screw from working out. Power is transmitted from the blower wheel by four splined grooves in the hub to four splined ribs in the sleeve of the coupling. The chief advantages of this coupling are said to be maximum flexibility with minimum of parts; simple assembly in burner with only one set screw; permits the use of cheaper and shorter shaft motors; eliminates end thrust on oil pump and resulting leaks.
MADE BY—*The Torrington Mfg. Co., Torrington, Conn.* *5*

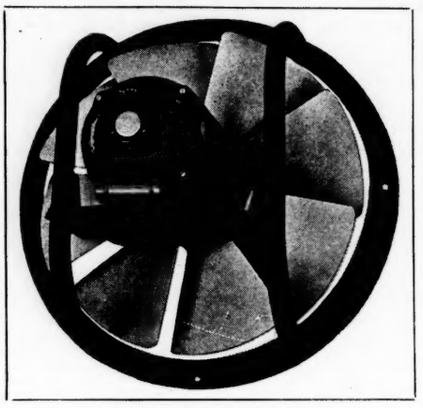
Jenkins U-Bolt Valve

NAME—Bronze mounted and all-iron U-bolt gate valves.
PURPOSE—A gate valve with special provision for quick disassembling for inspection or repair.
FEATURES—The manufacturer states that this valve combines quick and easy disassembling for inspection or repair with a higher resistance to springing and distortion. The valve incorporates a renewable "bonnet-saver-bushing" which makes it unnecessary to junk the valve bonnet when operating threads are worn. Another advantage claimed is that because this bushing can be lifted out, the user can get into the upper part of the bonnet chamber to clean out any deposits that form there.
LITERATURE AVAILABLE—Bulletin 179.
MADE BY—*Jenkins Bros., New York.* 6



Staynew Air Filter

NAME—Wire-Klad air filter.
PURPOSE—For air cleaning.
FEATURES—Filter incorporates the Protectomotor principle of construction which affords a large filtering area in relatively small space. Added to the fin is a wire mesh reinforcement which is said to make the filter so strong that it can be cleaned indefinitely by high pressure air or vacuum. Several kinds of filtering media are available. The most usual type is a cotton or a wool felt-like material known as Feltex. If exposure to oil or greasy substances makes cleaning with a solvent necessary, the wire reinforced filter insert can be easily lifted from the frame. When the filter element is worn out, only the wire reinforced filter insert need be replaced. The manufacturer states that the filter is flame resistant.
SIZES—Four standard sizes, 20 x 20, 16 x 20, 16 x 25, and 20 x 25, with three standard depths, 2, 4, and 6 in. Special sizes available.
MADE BY—*Staynew Filter Corp., Rochester, N. Y.* 7

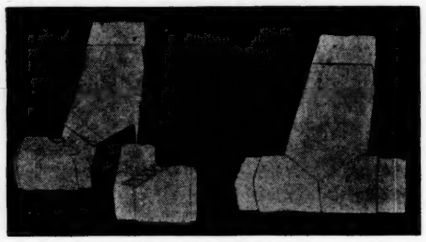


Airtherm Exhaust Fans

NAME—Air-Vent.
PURPOSE—Heavy duty type exhaust fan.
FEATURES—Motors on these fans are fully enclosed and have a special type of mounting. The manufacturer states that the fans are ideal for ductwork because they will not lose efficiency against reasonable back pressure. Explosion-proof motor and aluminum blades can be supplied on all models.
LITERATURE AVAILABLE—Bulletin HV-98.
MADE BY—*Airtherm Mfg. Co., St. Louis, Mo.* 8

Carey Asbestos Duct

NAME—Careyduct.
PURPOSE—To distribute conditioned air throughout a building using a central conditioning unit.
FEATURES—Careyduct is a prefabricated insulated duct made entirely of asbestos. It is said to have great strength and a high insulating value. Because of its design, it is a simple matter to make fittings, and is easy to erect. Friction factor is comparable to that of metal duct. Noises emanating from mechanical equipment are said to be materially reduced by this material.
MADE BY—*The Philip Carey Co., Lockland, Cincinnati, Ohio.* 9

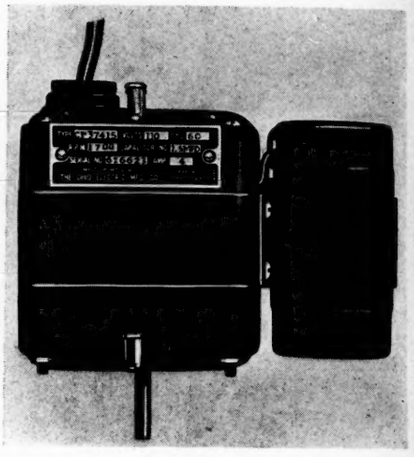


Oster Pipe Vise Stands

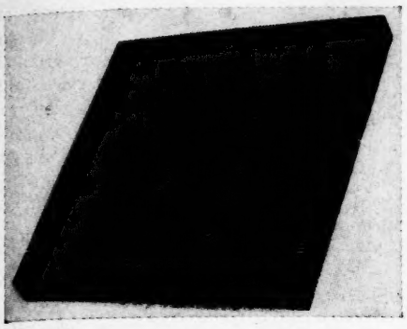
NAME—Oster power pipe vise stand.
PURPOSE—For thread cutting and reaming all sizes of pipe up to 2 in. inclusive, by power.
FEATURES—The pipe is gripped in a universal, bar-operated, scroll type chuck and is revolved by the power unit concealed in the upper part of the stand on which the pipe vise is usually mounted. The die-stock, cutter or reamer is placed on the pipe in the conventional manner with the handles resting on sliding arms which are built in the sides of the stand. When the power is turned on, the sliding arms take the torque of the pipe tools as the threading, cutting-off and reaming operations are performed. Power is furnished by a universal, variable-speed motor, geared to the spindle holding the chuck, giving the chuck variable speeds from 14 to 32 r.p.m. according to the load of the cut. The motor can be connected to an ordinary 110 volt lighting circuit. The height of the stand is 40 in.; width, 20 in., and length overall, including carrying handles, 30 in.
MADE BY—*The Oster Manufacturing Co., Cleveland, Ohio.* 10

Ohio Split Capacitor Motor

NAME—Ohio split capacitor motor.
PURPOSE—A permanent split capacitor motor for driving small fans, hot water circulators, and other light powered devices.



FEATURES—Motor illustrated operates vertically, shaft down, and is used to circulate the water in hot water heating systems. It is rated 1/100 hp. at 1700 r.p.m. with a start torque of .75 oz. ft. equal to 150% of the full load and a maximum running torque of 2.5 oz. ft. equal to 500% of the full load. At full load the current equals .35 amperes at 110 volts and the efficiency is said to be double that usually expected in small motors. Motor can be built with solid or resilient base to operate horizontally for floor, right or left sidewall, or ceiling mounting, also said to operate vertically with shaft extension up or down. Bearings are oil tight and they are designed for at least 1000 hr. of operation per oiling.
SIZES—Motor is rated from 1/150 to 1/20 hp. depending upon the capacitor employed. Speeds are 850, 1700, or 3400 r.p.m.
MADE BY—*The Ohio Electric Mfg. Co., Cleveland, Ohio.* 11



Burgess Air Filter

NAME—Long life air filter.
PURPOSE — A throw-away type filter for warm air furnaces, ventilating, and air conditioning systems.
FEATURES—Air is cleaned as it impinges against layers of expanded fiber which have been sprayed with a sticky compound. Three sections, a coarse, medium, and fine mesh, make up the completed filter. Each section consists of seven layers of expanded fiber. Tests indicated that the filter will hold 132 grams of standard dust for every square foot of frontal area. Filter's efficiency ranges from 86 to 100%, depending upon the size of the dust. When the filter is new the resistance to air flow at 250 f.p.m. is 0.01 in. of water.
MADE BY—*C. F. Burgess Laboratories, Inc., Chicago.* *12*

Black & Decker Electric Drill

NAME—"Shorty" electric drill.
PURPOSE — For drilling in cramped quarters.
FEATURES—Chuck spindle is mounted at right angles to the motor and reduces the overall working length of the tool to 4½ in. Deep vents cast in the gear-head provide for free passage of air even though the tool is grasped by the head.
SIZES—3/16 and ¼ in. sizes.
MADE BY—*The Black & Decker Mfg. Co., Towson, Md.* *13*

Fairbanks Gate Valve

NAME—Fairbanks U-bolt gate valve.
PURPOSE—For steam lines up to 150 lb. per sq. in. or gas and liquid lines up to 225 lb. per sq. in.
FEATURES—This valve is designed to meet the demand for a rugged valve at a low cost. It is said that it can be taken apart, inspected and cleaned with a minimum of effort and time. U-bolt locks the body and bonnet firmly together, making a pressuretight joint and adding strength. By removing only two nuts the valve can be disassembled. A double-taper wedge-shaped gate with a knife edge at the bottom is designed to cut through heavy fluids or sediment. Foreign matter is thus forced from the bottom of the wedge chamber where it can flow through the line. When the wedge is fully open it is above the flow. Valve is designed so that it can be repacked under pressure when fully open without leakage.
SIZES—From ½ to 4 in.
MADE BY—*The Fairbanks Co., New York.* *14*

Capillary Air Conditioning Units

NAME—Capillary air conditioning units.
PURPOSE—A device to bring air and water into contact for purposes of humidifying or dehumidifying.
FEATURES—The basic part of the capillary conditioner is the cell, or cells, each one of which is a rectangular casing filled with an oriented mass of fine glass filaments. The cell casing is open at the top and bottom, except for 2-in. mesh heavy wire screens. These hold in place thin layers of glass filaments, arranged in a horizontal direction, between which the vertical strands are held. The horizontal filaments have no appreciable effect on the resistance to flow of air or water. The manufacturer states that the number of filaments in a standard 20 x 20 in. cell is approximately 57,000. In operation water in the form of large drops or small streams is permitted to fall on the top layer of horizontal filaments. It then tends to spread and run along these until collection in mass causes it to fall on or transfer itself to the vertical strands below. As it then flows down these vertical strands by gravity, capillarity retards its rate of motion and causes it to spread out in an extremely thin film. At the lower end of the vertical strands the surplus of water is transferred to the bottom horizontal layer, where it clings by capillarity until it forms drops large enough to fall into a collecting pan below. Simultaneously with this the air, propelled by any standard type of fan or blower, passes through the cell in about 60,000 separate streams. The manufacturer states that the mechanical effect of this is to make the film still thinner, while at the same time the presence and flow of the water lubricate the passage of air. It is stated that in actual practice a packing 8½ in. deep gives saturating efficiencies in excess of 95% even when used with temperatures as low as 35 to 50F. It is also stated that the air is cleaned as well as humidified or dehumidified when it passes through this conditioner. The manufacturer claims that all solid matter down to 5 microns and most microns down to 1 are removed. Foreign particles adhering to the flowing water surfaces are carried into the tank below where they are picked up in the strainer or washed into the sewer. This type of conditioner may be used in all cases where the common practice of recent years would have specified spray washers. Since the conditioner cleans the air it is claimed that no additional filters are necessary

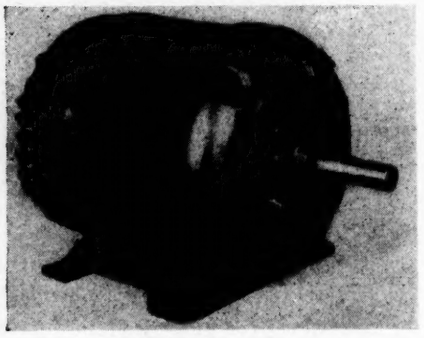
except in those installations where large amounts of lint or hair are encountered. These conditioners are available in many sizes and arrangements for different applications. Complete capillary air conditioners, embodying all the essential parts necessary for complete treatment of the air, are available.
MADE BY—*Air & Refrigeration Corp., New York.* *15*

Baldor Glass-Insulated Stream Cooled Motor

NAME—Baldor glass-insulated Streamcooled motor.
PURPOSE—An air-cooled, glass-insulated electric motor.
FEATURES—These motors are the standard Baldor open motors in integral sizes, now solidly enclosed and protected against dust, dirt, splash and danger of internal damage to the motor. They are cooled by means of an outer fan blowing a stream of air directly over the outside of the exposed laminations. A glass-woven fabric is used as insulating material in this motor. It is said that this material is unaffected by moisture and is resistant to acid and oils, is fireproof, and will not decay. The manufacturer states that the use of glass as an insulating material, plus Streamcooled design makes possible a motor considerably smaller in size and lighter in weight than the older type.
SIZES AVAILABLE—1½ to 20 hp. in three-phase, 220/440 volt, 60 cycle, 1725 r.p.m. motors.
MADE BY—*Baldor Electric Co., St. Louis, Mo.* *16*

Armco Zincgrip

NAME—Armco Zincgrip.
PURPOSE—A heavily zinc coated steel sheet for use in severe drawing or forming operations.
FEATURES—The manufacturer states that Armco Zincgrip will not crack or peel when subjected to severe drawing or forming operations. It is provided in either coils or sheets and carries from 50 or 75% more protective zinc than tight-coat sheets generally used for fabricated products.
MADE BY — *The American Rolling Mill Co., Middletown, Ohio.* *17*

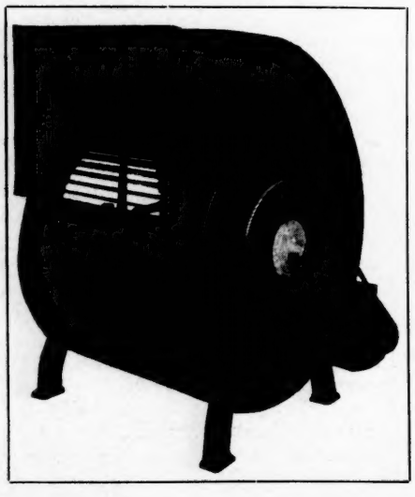


Wagner Motors

NAME—Integral-horsepower type RG repulsion-induction motors.
PURPOSE—For operating refrigerant compressors, air compressors, viscous liquid pumps, and like machinery.
FEATURES—The salient characteristics of the Wagner type RG repulsion-induction motor are said to be: (1) high starting torque; (2) low starting current; (3) positive starting on low voltage; (4) high power-factor, and (5) high efficiency. The ventilating openings are provided in the endplates and are located and protected so that falling objects cannot get into the motor. Endplate bolt holes are evenly spaced permitting 180° rotation of endplates for wall and ceiling mounting.
SIZES AVAILABLE—1 to 3 hp.
MADE BY—*Wagner Electric Corp., St. Louis, Mo.* *18*

Reynolds Warm Air Blowers

NAME—Direct Shot warm air circulation blowers.
PURPOSE—Blower for use with warm air heating plants.
FEATURES—The manufacturer states that the mouth is adjustable to any position; that the blowers are quiet and operate without vibration. Speed control is included and blower is belt-driven from an electric motor.
SIZES AND CAPACITIES—Six sizes in capacities from 2500 to 30,000 c.f.m.
MADE BY—*Reynolds Manufacturing Co., Grand Rapids, Mich.* *19*

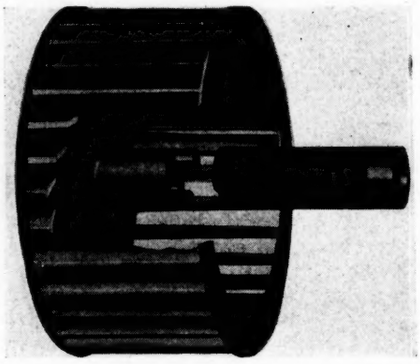


Harnischfeger Arc Welder

NAME—P&H-Hansen arc welder, 150 ampere, vertical type.
PURPOSE—For welding lighter gage metals, both ferrous and non-ferrous.
FEATURES—Unit is designed to occupy a minimum of floor space and is equipped with plug-in type cable receptacles for easy current reversing, and patented, single-current control. Furnished in the a.c. drive only. A towing handle provides for easy movement while stability is obtained when raised to form a 3-point base. Unit can also be furnished with a lifting ring and without wheels where portability is not necessary.
MADE BY—*Harnischfeger Corp., Milwaukee, Wis.* *20*

Lovejoy Flexible Couplings

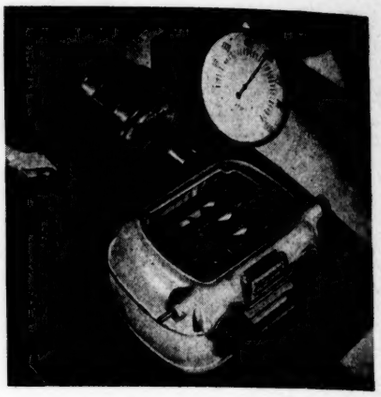
NAME AND MODEL NUMBER—L-R Double-flex flexible coupling, style UX.
PURPOSE—For transmitting power not in excess of ¼ hp. to oil burners, refrigerators, and other like applications.
FEATURES—This device consists of two jaw units and a cushion unit, made of a solid, tube-shaped section with the center composed of hard rubber and the ends where it contacts the



jaws fashioned out of a more resilient rubber. This assembly is said to produce a coupling which is strong, flexible, smooth-running and noiseless. The manufacturer states that it is possible to purchase from fan makers fans with a hub built in the form of an L-R flexible coupling jaw (see illustration). If this is done, only two units have to be purchased to complete the coupling, that is, one hard rubber center piece and one jaw. Besides this economy, it is said that the coupling makes possible the use of short shaft motors.
MADE BY—*Lovejoy Flexible Coupling Co., Chicago.* *21*

Allis-Chalmers Speed Changer

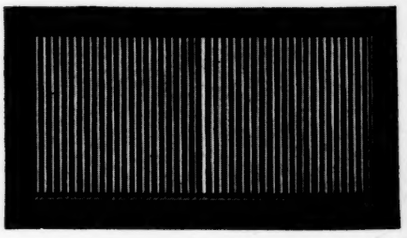
NAME—Vari-pitch speed changer.
PURPOSE—Connecting device for providing a variable speed drive.
FEATURES—This speed changer utilizes the principle of the Allis-Chalmers vari-pitch sheave. It is totally enclosed and is designed with a double



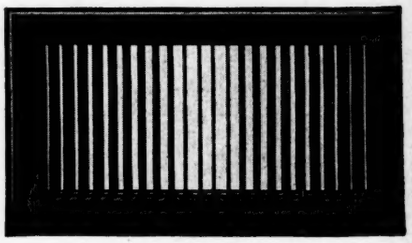
shaft extension and can be driven from any standard motor. Where the change in speed is to be adjusted manually only, the unit is provided with a readily accessible hand wheel control. The unit may also be equipped for electric or manual remote control.
CAPACITIES—Up to 33 hp. with speed ratios as high as 3¾ to 1.
MADE BY—*Allis-Chalmers Manufacturing Co., Milwaukee, Wis.* *22*

Auer Registers

NAME—Auer Dura-Flo and Fin-Flo.
PURPOSE—For use with warm air heating or air conditioning systems.
FEATURES—The Dura-Flo register is of the wall type and has a straight bar face with fixed bars either set for one direction or multi-directional. The frame is braced and welded and bars are mortised and locked into it. The Fin-Flow register is of fin-type design with thin blades which are fixed at the factory. They are set in any directional grouping. This register is intended especially for forced air systems of heating or cooling. The fin blades are locked into the frame.
SIZES—Both registers are available in all standard sizes and finishes.
MADE BY—*Auer Register Co., Cleveland.* *23*



Auer Fin-Flo register



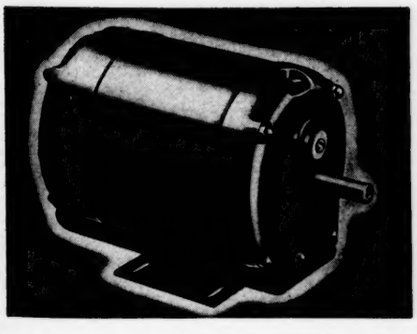
Auer Dura-Flo register

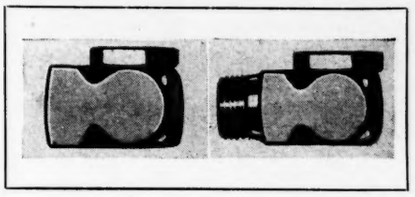
Ilg Air Supply Unit

NAME—Ilgairator.
PURPOSE—For supplying outside filtered air to rooms.
FEATURES—Unit is designed to be used with any sliding sash window. Made in four adjustable panel widths for various size windows. An air flow regulator provides for the introduction of air in the exact volume desired. A revolvable no-draft grille permits the deflection of fresh air in any desired direction. Electrical consumption is 40 watts per hr. Filter is replaceable. Cabinet is finished in walnut grain.
CAPACITIES—250 cu. ft. per hr.
MADE BY—*Ilg Electric Ventilating Co., Chicago.* 24

Ohio Belt-Tightening Motor

NAME—Belt-tightening motor.
PURPOSE—A resiliently mounted motor especially designed for belt tightening with over-drive belts such as are used for driving furnace blowers.
FEATURES—These motors are equipped with a special belt-tightening design for over-drives where the belt must pull on the top side of the pulley so that air will be driven into the bottom of the furnace. Such belts naturally lengthen after two weeks service but since this tightener will take up over an inch it is said to save many a failure in service and service calls. The motor is supported above and off the shaft center so that its own weight provides the initial belt tightening effect. This effect is increased proportionally to the load by the reaction of the rotor to the stator causing the motor to swing away from its load and so tighten the belt just the proper amount. Also introduced is a belt tightener without springs for underdrive belts such as are usually employed in driving pumps and compressors. In these the motor is resiliently supported off and below the shaft center. These motors incorporate capacitors and thermal overload cutout switches within the end bell if required. This tends to maintain a smooth streamline effect.
MADE BY—*The Ohio Electric Mfg. Co., Cleveland.* 25





Spraying Systems

NAME—"Whirljet" spray nozzles.
PURPOSE—For air conditioning, water cooling, air washers, air coolers, brine spraying, heat exchangers in general.
FEATURES—Nozzles are said to be of sturdy construction accurately machined and are designed to produce a uniformly distributed hollow cone spray, highly atomized.
SIZES AND CAPACITIES—With removable cap, male or female pipe connection ⅛ to ¾ in. One-piece construction female pipe connection 1 to 2½ in. with capacities from 0.1 to 107 g.p.m. at 10 lb. pressure.
MADE BY—*Spraying Systems Co., Chicago, Ill.* 26

Celotex Duct Insulation

NAME—Q-T. ductliner.
PURPOSE—To absorb air-borne noise, to insulate the duct against thermal loss, to dampen duct wall vibration and to eliminate the "speaking tube" characteristic of duct ventilation.
FEATURES—The liner, which is fabricated of rock wool with a suitable binder, is available in two thicknesses, ½ in. and 1 in., to give a maximum range of sound absorption. For average conditions the manufacturer recommends the ½-in. thickness. The binder employed is said to be impervious to water and water vapor. Acoustical Materials Association laboratory tests assign the following acoustical values:

SOUND ABSORPTION COEFFICIENTS

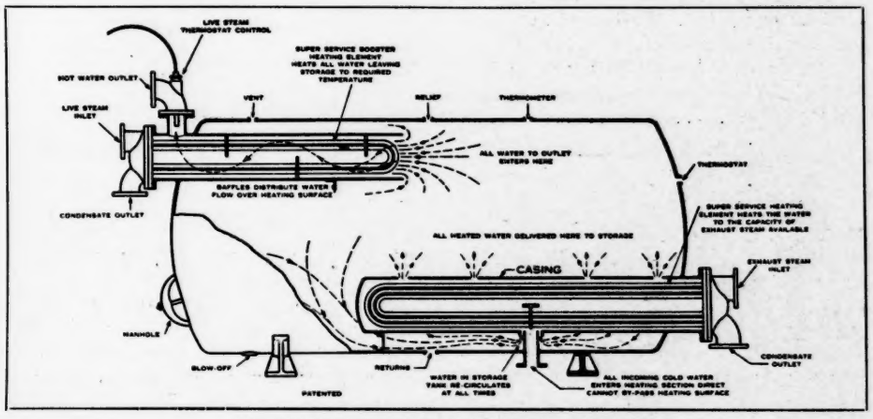
FREQUENCY	½ IN.	1 IN.
128	0.35	0.43
256	0.25	0.37
512	0.54	0.69
1024	0.75	0.78
2048	0.76	0.78
4000	0.66	0.70
*N.R.C.	0.60	0.70

*The noise reduction coefficient is the average of the coefficients at frequencies from 256 to 2048 cycles inclusive.

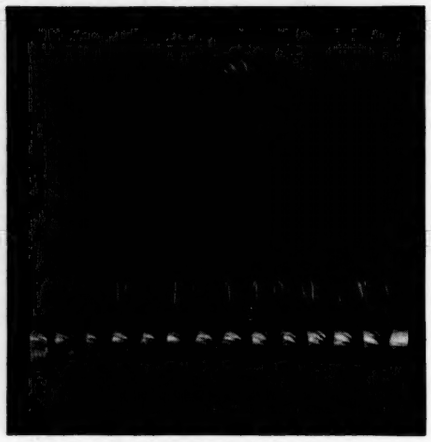
MADE BY—*The Celotex Corp., Chicago, Ill.* 27

National Storage Heater

NAME—National Super-Service storage heater.
PURPOSE—A combined storage tank and heater for supplying hot water.
FEATURES—All entering water passes directly into the bottom of a casing which completely encloses the heating element. The outflow openings at the top of the casing are proportioned and located so as to distribute the flow of water over the entire heating surface. The water opening at the bottom of the casing is proportioned to cause recirculation of storage water at all times whether the water is being drawn or not. A live steam booster element may be provided to maintain a given final temperature where exhaust or low-pressure steam is not available in sufficient quantities to heat the required amount of water up to the desired temperature. This unit is located at the upper zone of the storage tank and all the water leaving the heater must pass through the entire length of the unit.
MADE BY—*The National Pipe Bending Co., New Haven, Conn.* 28


LIVE STEAM THERMOSTAT CONTROL
SUPER SERVICE BOOSTER HEATING ELEMENT HEATS ALL WATER LEAVING STORAGE TO REQUIRED TEMPERATURE
HOT WATER OUTLET
VENT
RELIEF
THERMOMETER
LIVE STEAM INLET
ALL WATER TO OUTLET ENTERS HERE
THERMOSTAT
BAFFLES DISTRIBUTE WATER FLOW OVER HEATING SURFACE
CONDENSATE OUTLET
SUPER SERVICE HEATING ELEMENT HEATS THE WATER TO THE CAPACITY OF EXHAUST STEAM AVAILABLE
ALL HEATED WATER DELIVERED HERE TO STORAGE
CASING
EXHAUST STEAM INLET
MANHOLE
BLOW-OFF
RETURNS
CONDENSATE OUTLET
WATER IN STORAGE TANK RE CIRCULATES AT ALL TIMES
ALL INCOMING COLD WATER ENTERS HEATING SECTION DIRECT CANNOT BY-PASS HEATING SURFACE
PATENTED

National Super-Service storage heater

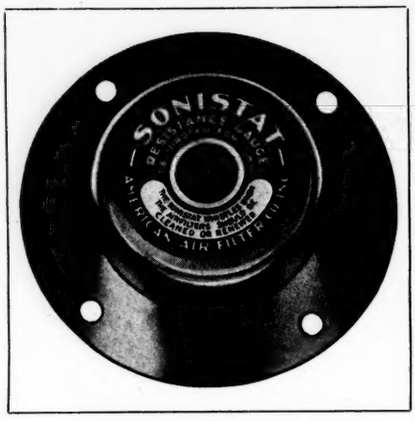


Peerless Extended Surface Coils

NAME—Peerless High Dispersion coils.
PURPOSE—For heating or cooling air using steam, water or refrigerant.
FEATURES—This coil differs from the usual surface coil in that a large amount of spines are used in place of the usual flat fins. These coils are made by cutting from the outer surface of thick walled copper tubing hundreds of slender spines. The spines are bent so that they are in an erect position and since they are made from the copper tube there is a perfect bond between them and the tube itself. The manufacturer states that constructing a coil in this manner increases the heat transmission greatly because the insulating air film surrounding the spines is extremely thin. It is said that the thousands of spines create considerable turbulence which helps to increase the heat transfer; however, because of the high efficiency the tubes are considerably shallower than ordinary fin coils and therefore the air friction through the coil is not unfavorably affected. The coils are standardized and have the following dimensions: overall diameter, 2 in.; helical spacing of rows of spines, ⅛ in.; number of spines per turn, 40. Supporting frames and end plates are constructed of brass and when the coils are assembled they are electro-tin plated as a unit to protect them against corrosion. Coils are available for heating or cooling using water, steam, or direct expanded refrigerant.
MADE BY—*Peerless of America, Inc., Chicago, Ill.* *29*

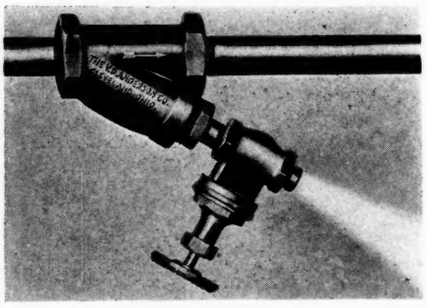
American Resistance Gage

NAME—Sonistat.
PURPOSE—A warning device for indicating when air filters should be changed.
FEATURES—This device is made up of a specially calibrated metal reed which is designated to sound a warning note when the filter resistance reaches 0.25 in. w.g. This signal is continuous when fan is in operation and indicates to the operator of the system that the filters should be cleaned or changed. The device should be placed on the outside of the duct or housing between the filters and the fan intake so that it will be affected by the pressure differential caused by the resistance of the filter. This device is applicable to furnace blowers, unit air conditioners, and similar equipment in which the filter resistance should not exceed ¼ in. w.g.
MADE BY—*American Air Filter Co., Inc., Louisville, Ky.* *30*



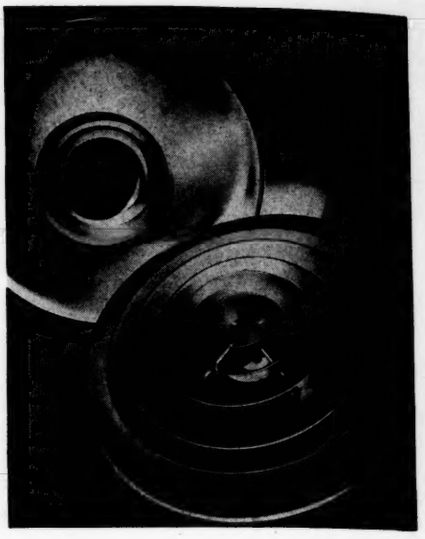
Anderson Strainers

NAME—Self-cleaning strainer.
PURPOSE—For straining gases or liquids with pressures up to 250 lb. at 450F.
FEATURES—Strainers are of alloy cast iron with strainer elements. They may be used on pressures up to 300 lb. where the temperature does not exceed 250F. The manufacturer states that prices on these strainers are low.
SIZES AVAILABLE—¼ to 2 in. pipe sizes.
MADE BY—*The V. D. Anderson Co., Cleveland, Ohio.* *31*



Supply and Exhaust Anemostat

NAME AND MODEL NUMBER—Anemostat Type A.
PURPOSE—To fulfill the following functions: air supply, air mixing, and air exhaust.
FEATURES—This Anemostat consists of two sets of hollow flared members spaced within each other. The passages

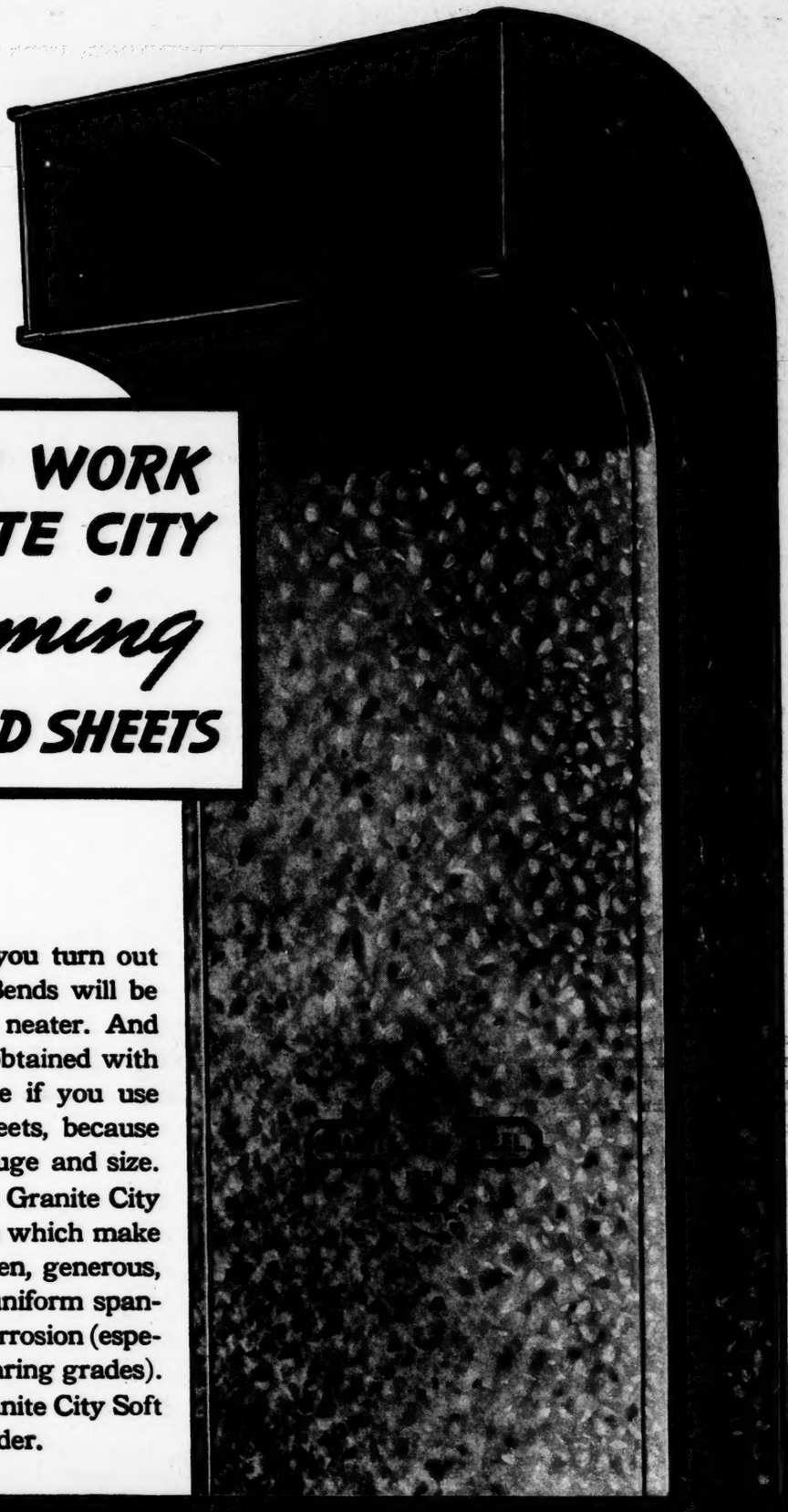


within the three outer members diffuse the conditioned air and draw room air into the device thus mixing room air with the conditioned air. Thus the passages between the three inner members have a suction effect only and extract air from the room. The aspiration effect through the three outer members is equivalent to 30% of the primary air supply while the extraction of the inner members may be as high as 70% of the primary air supply. It is possible to use this Anemostat in combination with a dropped light fixture. When this is done the air passing from the room through the three center passages removes most of the heat from the light bulb before it has a chance to warm the air in the room.
SIZES AND CAPACITIES—Available in eight sizes with capacities ranging from 52 to 3805 c.f.m. air supply and 27 to 1650 c.f.m. air exhaust with velocities ranging from 400 to 2500 f.p.m.
MADE BY—*Anemostat Corporation of America, New York.* *32*

Torrington Fan Blade

NAME—Airistocrat air circulator fan blades.
PURPOSE—A fan blade for producing a high velocity air stream of unusual quietness.
FEATURES—This blade is an addition to the Airistocrat line and has a diameter of 20 in. The manufacturer states that this blade is the result of two years of research and experiment to produce a blade with a lower noise level. The fan is constructed of aluminum alloy blades and steel spiders and hubs. It is made in pitch angles of either 18° or 13°.
SIZES—The Airistocrat line of fans now includes sizes from 8 to 24 in. and will soon include a 30-in. size; 36-, 42- and 48-in. sizes will follow later.
MADE BY—*The Torrington Mfg. Co., Torrington, Conn.* *33*

DO BETTER WORK WITH GRANITE CITY *Soft forming* GALVANIZED SHEETS



Easy working sheets will help you turn out finer looking sheet metal jobs. Bends will be truer, seams tighter, and joints neater. And these desirable results will be obtained with less work and a saving in time if you use Granite City Soft Forming Sheets, because they are uniform in ductility, gauge and size.

Other characteristics found in Granite City Soft Forming Galvanized Sheets which make for better finished jobs are an even, generous, tight coating of spelter; bright, uniform spangles; and unusual resistance to corrosion (especially, of course, in the copper bearing grades).

Ask your jobber to furnish Granite City Soft Forming Sheets on your next order.

SINCE GRANITE CITY SHEETS 1878

GRANITE CITY STEEL CO.

GRANITE CITY, ILLINOIS

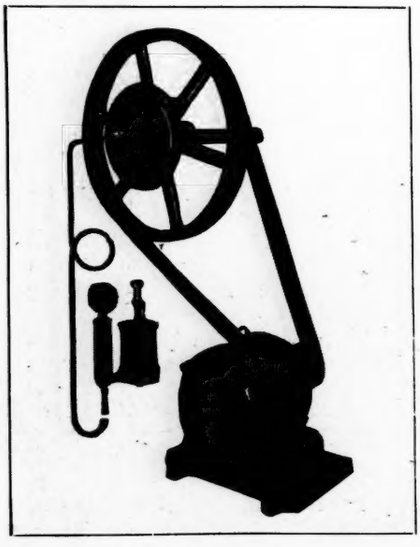
1803 Boatmen's Bank Building, St. Louis • 8 South Michigan Boulevard, Chicago • 1104 R. A. Long Building, Kansas City
1602 Mariner Tower, Milwaukee • 1613 Pioneer Building, St. Paul • 4000 York Street, Denver • 77 McCall Place, Memphis

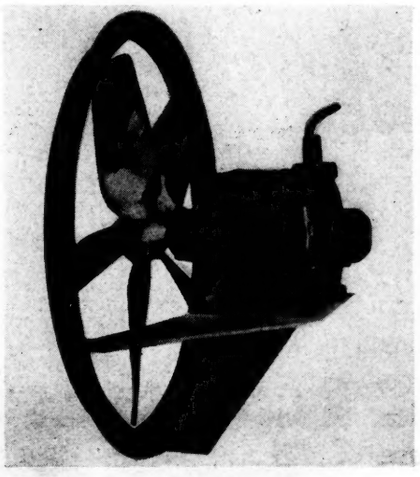
Dunham Year-Round Conditioning Unit

NAME—Dunham Temperator.
PURPOSE—For complete air conditioning including warming and humidification for the heating season and cooling and dehumidification for the summer, with filtering, ventilation and circulation the year-round.
FEATURES — The unit consists of a mixing damper, filters, two centrifugal blowers, a humidifying device and combined heating and cooling coil. This heating and cooling coil is so designed that there is three times greater capacity in cooling surface than is used for heating. Three fan speeds add to the adjustment for heating and cooling a given space. A unique damper either automatically controlled or hand-operated is used to regulate the amount of outside and inside air to be mixed and circulated. Changing from a heating to a cooling unit requires only the turning of a valve to provide cold water instead of steam.
SIZES AND CAPACITIES — Made in three sizes ranging from 100 to 350 sq. ft. of equivalent radiator surface. Cooling capacity when using 40F water is 9000 B.t.u. per hr.
MADE BY—*C. A. Dunham Co., Chicago.* *34*

U.S. Airco Variable Speed Pulley

NAME—Variable speed pulley and hydraulic remote control.
PURPOSE—For remote control of the speed of blowers.
FEATURES—This device is a friction type of clutch controlled by the pressure carried on a diaphragm contained in the pressure unit which is screwed on to the end of the blower shaft. The pressure is varied by the operator by the manipulation of the pump unit which can be remotely located at any convenient point. The blower pulley is not keyed to the impeller shaft but turns free on a tapered roller bearing and is driven at a constant speed by the motor. Attached to and concentric with the blower pulley is a driving disc which also rotates at constant speed with the blower pulley. Riveted to each side of the driving disc is a special asbestos friction disc of the correct area to transmit the load required at full speed. This driving disc rotates between a back and front pressure plate each of which is keyed to the blower shaft. As pressure is applied on the diaphragm of the pressure unit the pressure plates are forced against the friction surfaces of the driving disc and the speed of the blower is increased. It is possible to obtain a range of speeds from idling to maximum pulley ratio.
SIZES—For blowers requiring from 3 to 30 hp.
MADE BY—*United States Air Conditioning Corp., Minneapolis, Minn....35*



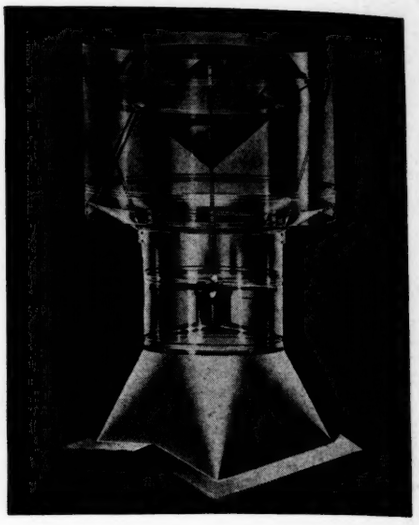


Binks Exhaust Fan

NAME AND MODEL NUMBER — Binks W F D exhaust fans.
PURPOSE—Ventilating fans for stores, factories, and similar plants.
FEATURES—Fans are furnished with a guard over a five-bladed propeller. They are said to be easily put in place in the window, transom, or other opening by mounting a wood or metal frame around the fan. Explosion-proof motors are available in various common specifications. These fans are not recommended where quiet operation is required.
SIZES—Sizes from 18 to 34 in.
MADE BY—*Binks Manufacturing Co., Chicago.* *36*

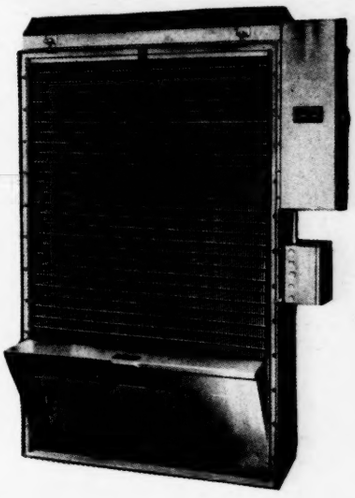
Burt Fan Ventilator

NAME—Burt Free-Flow fan ventilator.
PURPOSE—A fan type roof ventilator.
FEATURES—These ventilators are constructed of three parts, the base, head and fan barrel. Base and head are the same as supplied in the gravity unit with the exception of additional stiffening in the bases of the larger sizes to support the added weight of the fan assembly. The fan barrel consists of a section of round airshafting of sufficient length to house the motor mounting, motor and fan. Three types of ventilators are offered, one for ordinary ventilating problems where no adverse conditions are existent and the primary requisite is a high movement of air; the second for handling air at temperatures higher than electric motors are constructed to withstand; and the third for moving air containing fumes which are destructive to electric motors and metal parts. In the heat resisting type the motor is rigidly fastened in a sheet steel shell properly proportioned to allow an annular air passage between motor and shell. The action of the ventilator fan draws outside air through the support arms, upward between the motor and shell, discharging it into the main air stream at the top of the motor. By using these air intakes, a supply of cool outside air is obtained, independent of the main exhaust stream, which allows the ventilator to be used in temperatures much higher than would otherwise be possible. Heat resisting construction is available in any of the standard materials, including asbestos protected steel. The acid-resisting type is similar in design to the heat resisting type with two exceptions. A circular plate is fastened over the upper end of the motor between motor and fan, its outside edge extending just beyond the motor housing shell to prevent condensation from draining into the motor shell. The entire shell and support arms, both inside and outside, the motor, its shaft and fan wheel are heavily coated with acid-resistant asphaltic compound.
SIZES—Sizes range from 12 in. to 96 in.
MADE BY—*The Burt Manufacturing Co., Akron, Ohio.* *37*

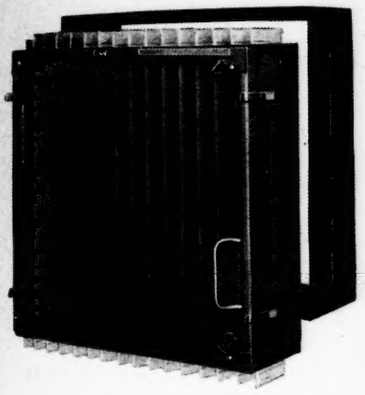


MULTI-PANEL AUTOMATIC

Multi-Panel automatic with the new armored panel for commercial and industrial air conditioning.

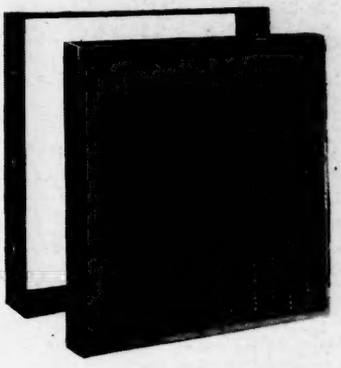


Multi-Panel is self-cleaning, fully automatic and provides, with a minimum of attention, constant uniform air supply.



Airmat Dry Type PL-24—for central air conditioning service. Uses Airmat paper in fibre glass media furnished in rolls.

A Filter for Every Domestic and Commercial Air Conditioning Need

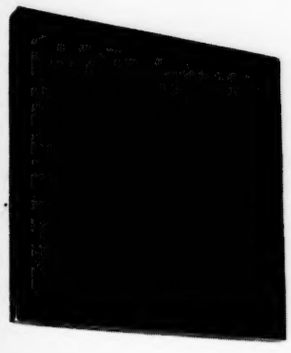


American Unit Filter—M/W-2 for cleaning re-circulated air in central systems; for unit air conditioners and domestic systems.

The American Air Filter Company offers a complete line of filters engineered to meet every air cleaning requirement.

The 5 filters shown on this page are but a few of the 150 different items offered in the full line of AAF air cleaning and dust control equipment.

Complete engineering data and bulletins descriptive of every AAF filter are available. Information on any specific air cleaning problem will be furnished gladly by our engineering department without obligation.



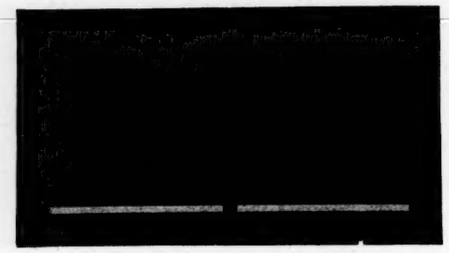
Washable Type A/C-2 permanent filter for domestic and commercial unit air conditioners. Can be cleaned and reVisconsined at cost of 5 cents.

Drifilter Type G contains a filter element made of pleated glass fibre, which is odorless, impervious to humidity and fireproof; may be cleaned several times before having to be replaced.

AMERICAN AIR FILTER CO., Inc.
INCORPORATED
119 Central Ave., Louisville, Ky.
IN CANADA: DARLING BROS., LTD., MONTREAL, P. Q.

The Symbol of Clean Air

DUST CONTROL AAF AIR FILTRATION



Style 145 adjustable-bar register

United States Registers

NAME AND MODEL NUMBER—Adjustable-bar registers, Styles 145 and 149.

PURPOSE—An air conditioning register which has a special adjustment to prevent scratching or cutting the finish.

FEATURES—A pin lever operator is used to adjust the register bars to any desired angle of air flow. This lever is inserted through the slot in the mullion of the horizontal design, Style 145, and raises or lowers the

Style 149 adjustable-bar register

directional air flow from 60° upflow to 60° downflow or any intervening angle. The Style 149 is mechanically of the same construction but the bars in the face are vertical and work in 50-50 groups. In other words, half swings one way in one group and half swings in another group. These groups can be adjusted to any angle, right or left, by inserting a round rod through the holes in the border.

SIZES AVAILABLE—8 x 6 to 30 x 10 in.

MADE BY—*United States Register Co., Battle Creek, Mich.* 38

Wagner High Torque Motors

NAME AND MODEL NUMBER—High torque double-capacitor motor, types RZN and RZNR.

PURPOSE—For application on humidifiers, stokers, refrigerant compressors, and other applications where high starting torque, constant speed, quiet operation, and long-hour performance are required.

FEATURES—Motor has two condensers of different value, a high value of capacitance for starting and a low value of capacitance for running. The change in capacitance occurs at approximately 75% full load speed by means of a centrifugal switch located on the motor. In appearance and construction, the motor is similar to the other Wagner capacitor and split-phase motors of the same size. The capacitor box mounted on top is slightly larger than those used on capacitor-start induction-run motors since it contains two condensers instead of one. However, the size has been reduced because it does not contain an auto-transformer. Motors are available in two types, type RZN when equipped with rigid mountings and type RZNR when equipped with annular resilient mountings.

SIZES AND CAPACITIES—Four sizes with capacities of 1/3, 1/2, 3/4, and 1 hp. Available in 110 and 220 volts.

MADE BY—*Wagner Electric Corp., St. Louis, Mo.* 39

Monat Gate Valve

NAME—Monat "Stream-Flow" cylindrical gate valve.

PURPOSE—A packless, cylindrical gate valve, suitable for high as well as low pressures and temperatures.

FEATURES—This valve contains the salient construction features of both gate and plug valves. The manufacturer states that there are no cavities and friction is practically eliminated. The body carries a cylindrical bore at right angles to the line of flow. The cylindrical gate is moved up and down by means of a screw in the valve bonnet and is prevented from turning by a key in the cylindrical bore. No packing is required and the only operating part in the line of flow is the gate itself. A cap on the bottom of the body and the removable bonnet permit cleaning the valve while it is in the line.

SIZES—½ to 8 in.

MADE BY—*Monat Valve & Forge Co., Pittsburgh, Pa.* 40

Monsanto Insulation

NAME—Santocel.

PURPOSE—A granular or powdered insulation for reducing the flow of heat through building constructions.

FEATURES—Santocel is a so-called silica aerogel; that is, it is a very light porous form of silica having an apparent density of less than 9 lb. per cu. ft. This material is available in either granular or powdered form. Heat transmission coefficients expressed in B.t.u. per hr. per sq. ft. per degree F per in. of thickness are reported as follows:

Mean Temp. F	K fine	K granular
104		0.14
114	0.17	
253	0.20	
312		0.21
360	0.24	

MADE BY—*Monsanto Chemical Co., Merrimac Div., Boston, Mass.* 41

Berger Window Ventilator

NAME—Silentaire.

PURPOSE—A window unit for ventilating, filtering, circulating and reducing noise.

FEATURES—The manufacturer states that this unit can be easily installed in any window and can be conveniently moved. The operating mechanism is said to be completely soundproofed.

MADE BY—*Berger Mfg. Div. of Republic Steel Corp., Canton, Ohio*.....42

TO OBTAIN FURTHER INFORMATION ON 1938 NEW EQUIPMENT FOR YEAR-ROUND USE

On the list below circle the item number of the equipment in which you are interested, using the number found at the end of each item.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42

(This service available only to engineers or executives)

Fill in your name and address, detach and mail to

HEATING & VENTILATING, 148 Lafayette St., New York, N. Y.

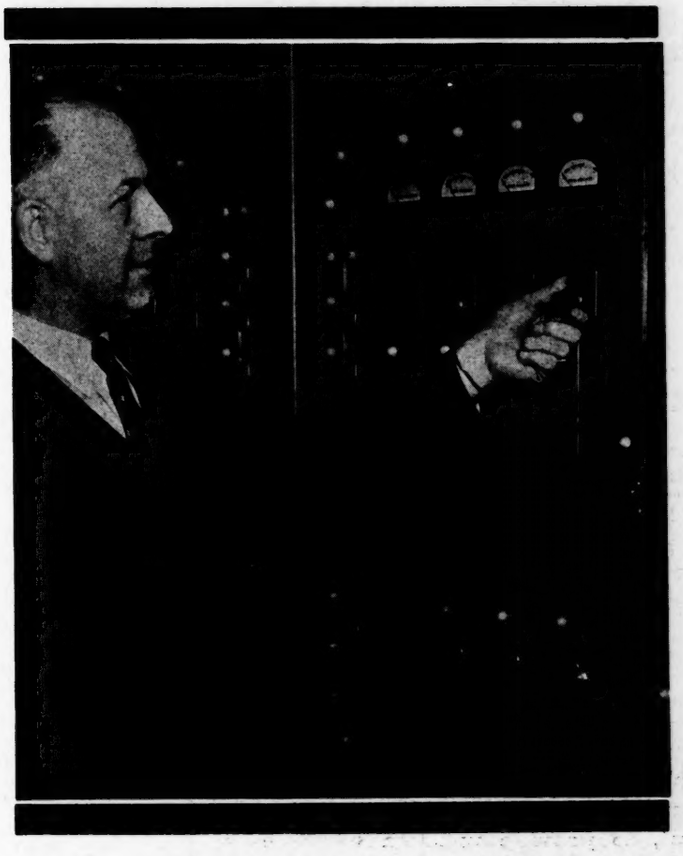
Name.....

Title.....

Firm.....

Business Address.....

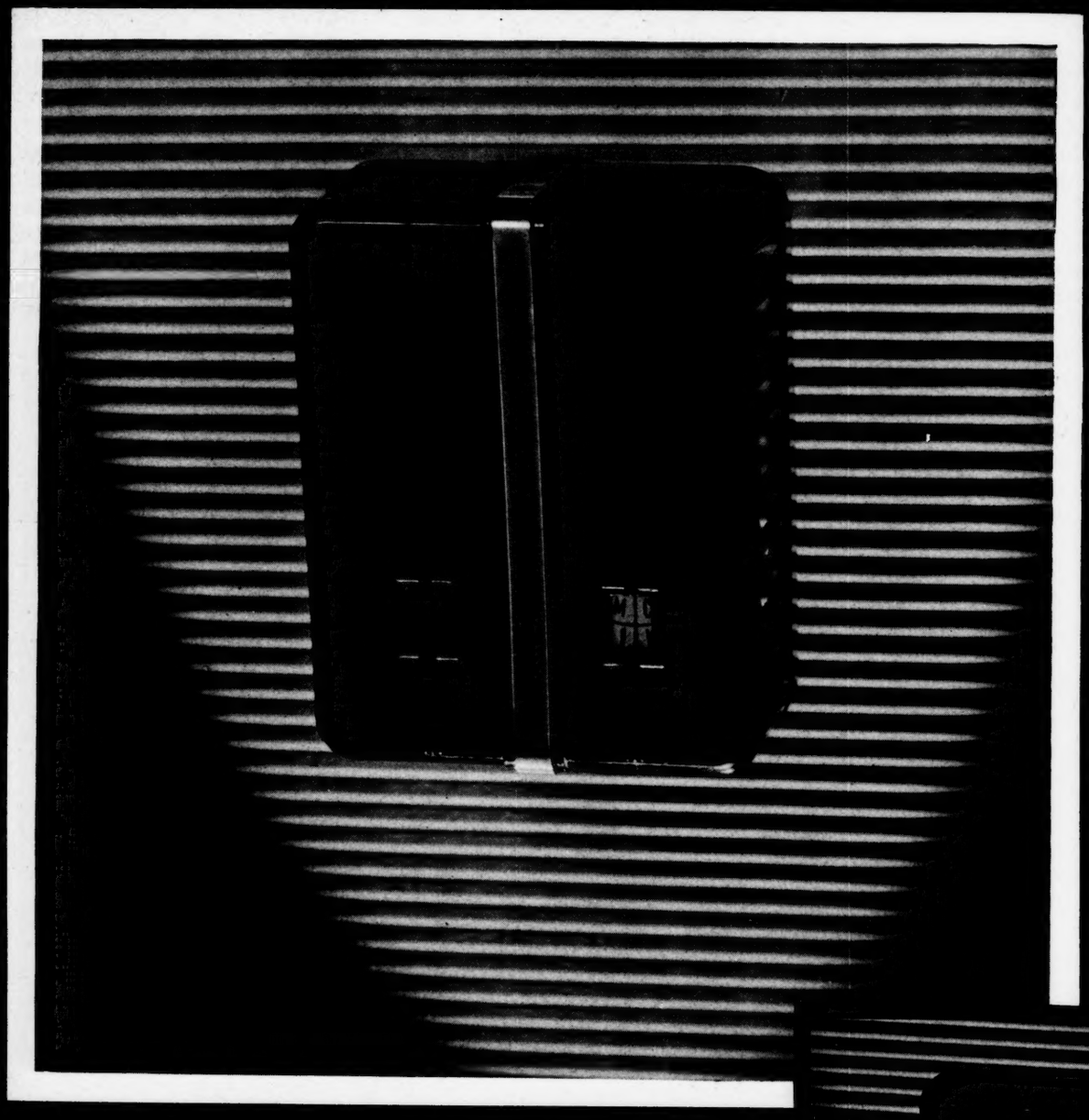
City and State.....1/39



ALL SEASON ESSENTIALS

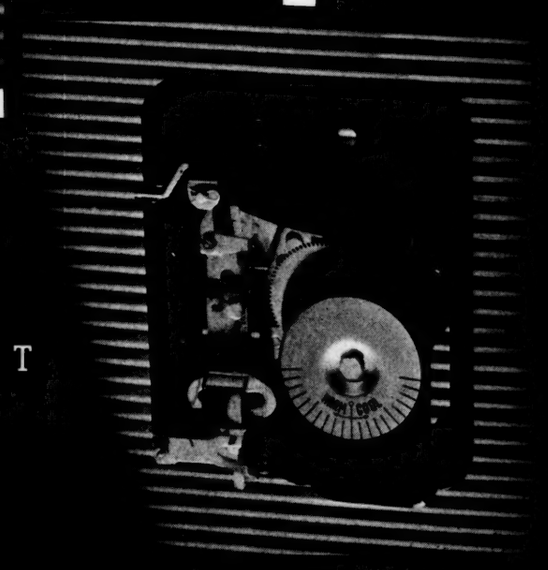
Pages 112 to 128

BARBER-COLMAN



CONTROLS

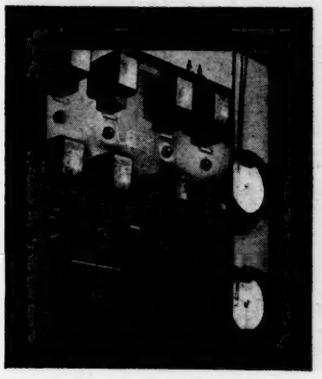
MICRO-COMFORTSTAT



BARBER-COLMAN COMPANY

ROCKFORD, ILLINOIS

Test Kits and Refined Controls Marked Year



Controls

AN examination of the controls and instruments which made their initial appearance on the market during 1938, and as reported monthly in the New Equipment pages of HEATING & VENTILATING, shows a tendency toward putting these necessities into the form of "kits" or packages arranged with an eye toward ready use or easy installation.

Thus controls for warm air furnaces with two-speed fan operation and with safety control of bonnet temperature as well as room temperature, are offered compressed into a single unit which can be mounted with a minimum of cutting and fitting.

Another case of this tendency toward kits is to be found in those prepared for field testing. Several appeared arranged for use in checking air flow in ducts and out of registers and grilles. Included in some of these kits are suitable thermometers for measuring air temperatures or even flue gas temperature. Similar arrangements for increased portability have made the CO_2 analyzer a much more readily used measuring device than ever before. Appearance of such kits reflects the growing necessity of making field tests.

Balancing of air flow is so important that increased attention has been given to anemometers and one of the most interesting which appeared during 1938 has a wide range of application and makes use of the principle of the cooling rate of a heated wire. In this instrument the bulb of a thermometer is heated by an electric wire wrapped around it.

Statistics

No monthly (or yearly) figures are available on sales of thermostats, limit switches, or any of the wide variety of controls and instruments, either separately or in bulk. For this reason it is not possible to present detailed statistics covering these equipments.

However, in the case of controls it is probably a safe conclusion that their sales are made up largely of, and at least approximately proportional to, the sale of automatic heating equipment and summer air conditioning. For this reason, and since the only units common to both are monetary, the estimated dollar value of summer air conditioning and automatic heating installations for each of the years of the past decade have been totaled and plotted in relative terms in the accompanying graph.

Referring to the graph, it is seen that this curve (as did almost all sales charts) dropped steadily from 1929 to 1932. Following the low year of the depression, however, there was a consistent increase in the index until 1937 when it reached a high for the decade of 158. The year 1938 was the first in which this index showed a decline, the figure dropping to 120; also below the 1936 figure.

Thermostats and Regulators

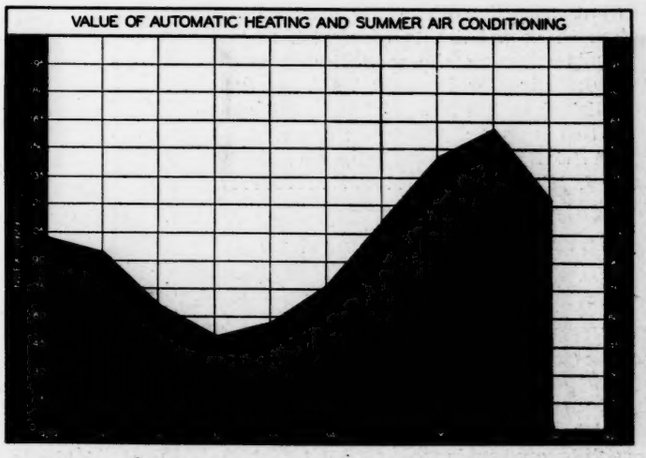
Thermostats arranged to control an effective temperature variation were brought out by a number of control makers during the year. Controls of this type are now available from many of the leading makers for use in summer or winter plants. These are usually arranged so that both temperature and humidity are sensed by sensitive elements and the variations furnish the necessary impetus to secure the desired changes.

Thermostats for a variety of special purpose applications were included in the equipment of the year. Although many of them represented improvements and redesigns there were several innovations. Generally the attempt to prevent overshooting and undershooting of desired temperature in occupied rooms was continued with the thought of minimizing the ups and downs of the control range. This is a problem which has challenged the ingenuity of thermostat designers for some time.

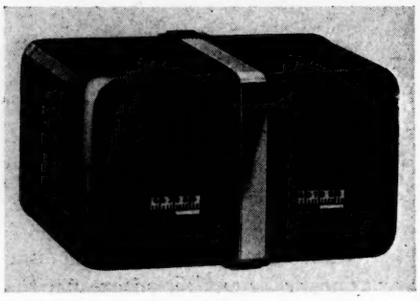
Refrigeration Controls

The necessity of automatic operation of refrigeration equipment in air conditioning applications brought forth new designs of thermostatic expansion valves and of automatic valves for maintaining constant back pressure with varying refrigeration loads.

As is always the case, all individual devices can not be singled out for mention and consequently the best way to keep abreast of instrument and control developments is to scan the record closely. These devices are so important that none should be overlooked; a careful reading of the following pages is urged for most of the year's new devices are included.



36 **An estimate of the total annual value of business in automatic heating and summer air conditioning relative to 1929 = 100. This chart is presented with the idea that both of these businesses are relatively new in recent years and have a trend distinct from the straight winter heating.**

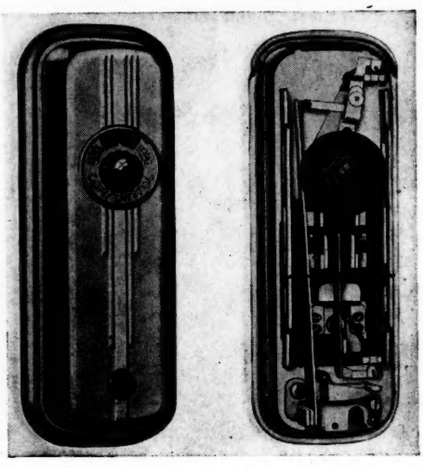


Barber-Colman Thermostat

NAME—Supertherm.
PURPOSE—For controlling the operation of heating equipment to give a predetermined room temperature.
FEATURES—This thermostat is designed to be mounted on the wall with the long dimension horizontal rather than vertical. The manufacturer states that this horizontal design produces a thermostat with a rapid response. The bimetallic element is also mounted in a horizontal plane so as to present the largest surface of the element to the vertical movement of air which is most prevalent in the room. The two horizontal windows in the front of the instrument carry the adjusting scale and the thermometer. The liquid type thermometer lies horizontal in the left window and the adjusting scale is in the right window. The adjusting pointer is made of a slider of red bakelite, thus giving an appearance similar to the rising liquid in the thermometer at the left. This instrument may be used in two- or three-wire circuits and is available with or without heat anticipating features, with or without detents giving snap action or floating action. All instruments are equipped with locking shoes which allow the adjusting lever to be locked in any position or locked against a high or low limit position. The Supertherm is housed in a bakelite case with metal bands covering the mounting screws. Standard color is black bakelite with polished stainless steel band, but special colors are available on order.
MADE BY—*Barber-Colman Co., Rockford, Ill.* 1

Friez Effective Temperature Controller

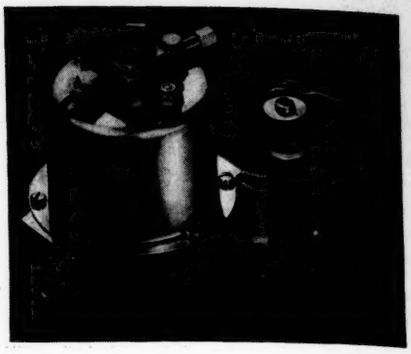
NAME—Friez Comfortrol.
PURPOSE—An instrument which automatically varies its own dry bulb point of control to compensate for the uncontrolled variations of humidity which exist in simple heating and cooling applications.
FEATURES—This instrument is really a humidity set thermostat, that is, the point of the dry bulb control is varied automatically to suit the relative humidity existing at the moment. When the humidity rises the dry bulb point of control is automatically lowered so as to maintain the same effective temperature. This is achieved by a bimetallic temperature element and a multiple hair element. The moving end of the bimetallic element is connected to a moving contact blade through a linkage movement and this in turn to the humidity sensitive human hair element. This device can be obtained



either for maintaining a single temperature or with the day-night feature. Standard effective temperature range 56 to 79F.
MADE BY—*Julien P. Friez & Sons, Inc., Baltimore, Md.* 2

Spencer Motor Thermostat

NAME—Klixon motor protection thermostat.
PURPOSE—Thermostat consists of a small thermostatic bimetal disc placed next to a heater wire. Contacts welded to the disc provide positive action and since they are placed in series with the line circuit, they will break the circuit when open. The thermostat is designed to protect the motor from overheating from any cause, yet interferes with the motor operation only when the overheating is a definite danger to the motor. The manufacturer states that in operation the thermostat follows closely the heat rise in the motor windings, compensates automatically for varying ambient versus load conditions and permits the motor to operate up to its peak safely under all conditions. The thermostat is applicable over the complete range of single phase a.c. fractional horsepower motors up to and including 1 hp. 110 and 220 volts. Available with either manual or automatic reset.
MADE BY—*Spencer Thermostat Co., Attleboro, Mass.* 3

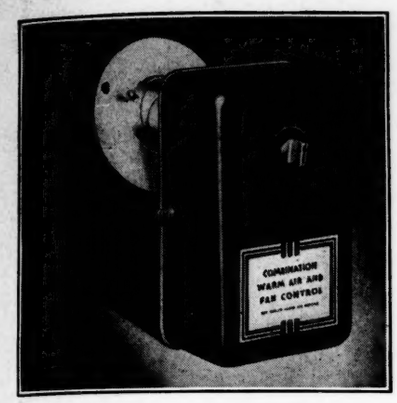


General Space Heater Control

NAME—General gas-fired space heater control.
PURPOSE—For automatic control of gas-fired space heaters.
FEATURES—No outside source of current is needed since a small pilot burner generator supplies the electric current for operation. According to the manufacturer this accomplishes a threefold purpose: (1) to check the pilot flame providing an automatic pilot control; (2) provides current for valve operation; (3) permits the use of an integral electric type thermostat with ½F total differential. The thermo-couple principle is used to generate the necessary current to operate the pilot control valve, obtaining its energy from the gas flame. The main valve is a gas-actuated diaphragm type. Since the current to operate the pilot valve is generated by the heat from the gas flame, any failure of the pilot flame automatically causes it to close. The unit is self-contained except for the pilot burner. It may be used for the control of circulating heaters, range heaters, gas radiators, floor furnaces, and like devices.
MADE BY—*General Controls Co., Chicago, Ill.* 4

Cutler-Hammer Starters

NAME—Across-the-line starter NEMA size 0.
PURPOSE—For use with polyphase squirrel-cage motors driving fans, pumps, and like equipment.
FEATURES—Among the features of this starter are pushbutton operation, positive quick make and break (twin break) mechanism, silver-to-silver contacts, three- and four-pole construction, thermal overload protection, free tripping type, and rubber-mounted operating mechanism. The starter is so constructed that it can be removed without disturbing the conduit.
SIZES AVAILABLE—Up to 2 hp., 550 volts.
MADE BY—*Cutler-Hammer, Inc., Milwaukee, Wis.* 5

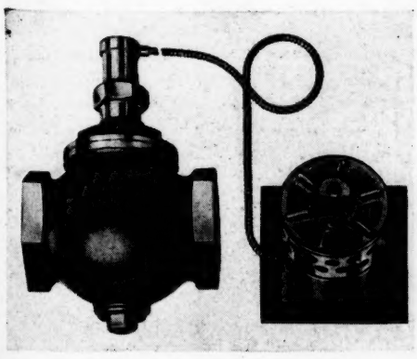


Perfex Warm Air Controls

NAME AND MODEL NUMBERS—Combination warm air and fan control, series 475, and two-speed fan control, series 470.
PURPOSE—To control the type of motor and carry the motor loads encountered in forced warm air heating.
FEATURES—All adjustments and settings are said to be easy to make as cut-in and cut-out points are plainly marked by pointers. The indicator on the external knob shows the temperature surrounding the thermal element. All models have summer cooling position marked on the cover. When the external indicator knob is turned to this position the fan will operate continuously providing a circulation of air for summer comfort. When the fan is to be stopped the knob is merely released. The manufacturer states that this makes it possible for the homeowner to provide summer operation of the fan without changing the control settings. Both models employ the Perfex twin contact switch mechanism which is said to eliminate flexible lead wires and to permit the controls to be mounted in any position.
MADE BY—*Perfex Corp., Milwaukee, Wis.* 6

Sterling Steam Control

NAME AND MODEL NUMBER—Sterling control, type F.
PURPOSE—For controlling the amount of steam that enters blast coils, unit heaters or any type of forced circulation heater.



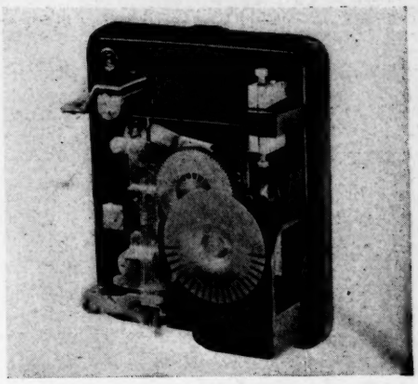
FEATURES—Operated from thermostat which can be placed as far as 50 ft. from the valve it controls. The thermostat does not have to be placed in the air stream. The valve is of stainless steel and has a stainless steel seat. The device is said to be sensitive to within 2F plus or minus.
SIZES AND CAPACITIES—½ to 3 in., steam pressures from 0 to 50 lb.
LITERATURE AVAILABLE—Bulletin No. 361.
MADE BY—*Sterling Engineering Co., Milwaukee.* 7

Young Remote Control Regulator

NAME AND MODEL NUMBER—Young remote control regulator, Model 700.
PURPOSE—For manually regulating the position of dampers from a remote location.
FEATURES—This device can be installed in an accessible location to control the operation of dampers or registers located at a distance. The regulator consists of a wall box, control mechanism, escutcheon and 7 ft. of stainless steel cable with an outer casing of 3/16 in. stainless steel wire and one stainless steel spring. Additional cables may be obtained if desired. The control box is placed at a convenient place and the figures on the dial tell how far the damper is open. The device is so constructed that the damper is regulated at all times by pulling on a wire and not by pushing. To secure this action a spring is used to close the damper and return the wire to its original position when the regulator releases the spring. A ratchet wheel is provided to lock the damper in position so that the wire can't slip.
LITERATURE AVAILABLE—Bulletin 10.
MADE BY—*Young Regulator Co., Cleveland, Ohio.* 8

Ellison Pitot Tube

NAME—Straight-stem type pitot tube.
PURPOSE—For measuring air velocities in thick wall ducts.
FEATURES—This tube was designed especially for use in thick wall ducts in which the angle type cannot be conveniently inserted. The outer tube is 5/16 in. outer diameter, the flow end of which is machined at an angle of 59° and is said to transmit a true static pressure through the 1/8 in. inner tube when faced at right angles to the flow. By means of a conical tip, facing the flow, a true impact pressure is transmitted through the outer tube.
MADE BY—*Ellison Draft Gage Co., Chicago, Ill.* 9

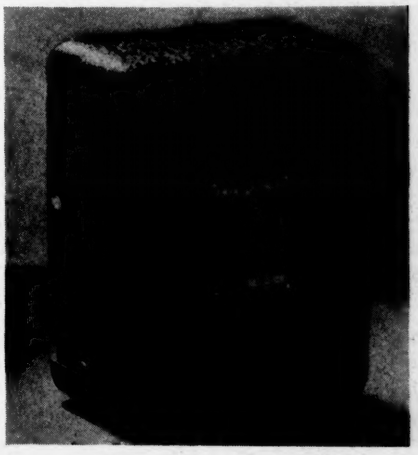


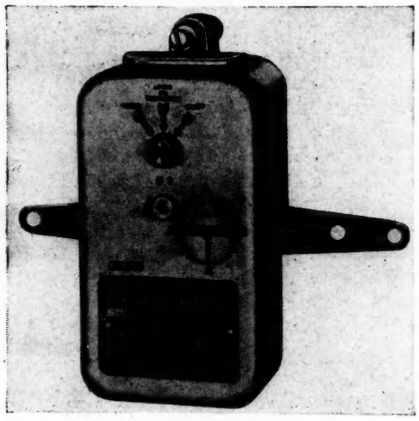
Barber-Colman Comfortstat

NAME—Comfortstat.
PURPOSE—For maintaining constant effective temperatures by changing the dry bulb temperature in accordance with changes in relative humidity.
FEATURES—This instrument can be set to maintain constant effective temperatures. This is done by varying the dry bulb temperatures so as to give the same effective temperature when the relative humidity changes. The instrument may be used on a three-wire control circuit connected to operate motor-operated valves, relays, damper controllers, and like devices.
MADE BY—*Barber-Colman Co., Rockford, Ill.* 10

General Controls Relay

NAME AND MODEL NUMBER—General RS 100.
PURPOSE—A relay capable of handling single phase motor loads up to 1 hp. or heating loads up to 1.5 kw.
FEATURES—The manufacturer states that an exclusive feature of the RS 100 is an extra terminal for supplying power to wall clocks, indicating lamps or small sensitive relays, eliminating the need for a separate low voltage source.
MADE BY—*General Controls Co., Chicago, Ill.* 11



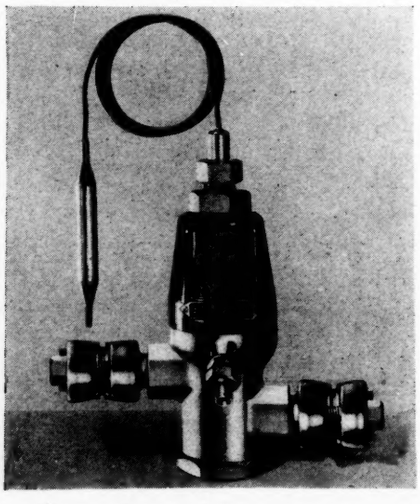


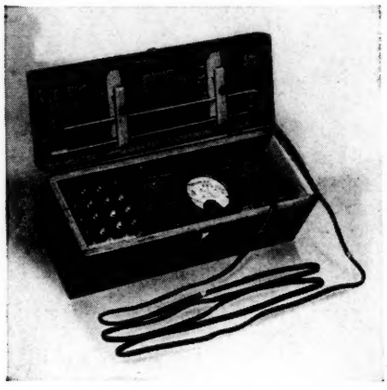
Gleason-Avery Motor

NAME—Low-voltage control motor.
PURPOSE—For operating from controls using a 20-volt current.
FEATURES—Motor operates on 20 volts drawn from a step-down transformer with a 110-volt input. An ordinary two-wire low-voltage cable, furnished with the motor, is used to complete the installation. The manufacturer states that the use of low voltage decreases the cost of installation both because of the reduced cost of wiring and the reduced cost of the motor. The thermostat controlling the motor is the same as that used in the high-voltage installations.
MADE BY—*Gleason-Avery, Inc., Auburn, N. Y.* *12*

Fedders Expansion Valve

NAME AND MODEL NUMBER—High capacity thermostatic expansion valve, model 37.
PURPOSE—For controlling the flow of refrigerant to evaporators in systems with capacities up to 20 tons for Freon and 44 tons for methyl chloride.
FEATURES—Valve follows the general design of the model 33 expansion valve but is larger not only in capacity but in size of working parts and refrigerant passageways. Valves are said to be easily adjusted by means of a convenient adjusting nut located at the top of the valve. The body of the valve is made of a heavy drop forge brass of dense homogeneous metal structure and is equipped with connection flanges with tail pipes for sweating refrigerant lines and a connection for equalizer tube. Valve body has a ½-in. female pipe tap inlet and a ¾-in. female pipe tap outlet for use where sweat fittings are not desired.
CAPACITIES—Up to 20 tons for Freon and 44 tons for methyl chloride.
MADE BY—*Fedders Mfg. Co., Buffalo, N. Y.* *13*





Willson Thermo-Anemometer

NAME—Willson Thermo-anemometer.
PURPOSE—For determining air velocities between 0 and 6000 f.p.m.
FEATURES—To determine the velocity of air movement at a given point, the bulb of the heated thermometer is held at the point in question and the temperature read as soon as it attains equilibrium. The thermometer bulb is heated by passing an electric current through the resistance wire on the bulb from batteries contained in the instrument case. The voltage used should be such as to give a temperature difference between the heated thermometer and the regular thermometer of not less than 15°. As the accuracy increases with the temperature difference, a temperature differential of 25 to 35F is desired whenever practicable. Knowing the temperature difference and the voltage used, the air velocity is read from the accompanying chart.
MADE BY—*Willson Products, Inc., Reading, Pa.* *14*

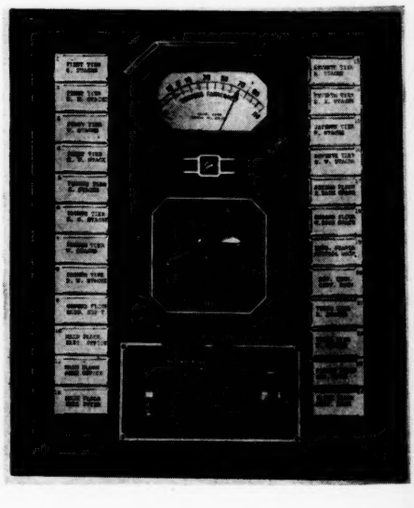
Mercoid Duct Temperature Control

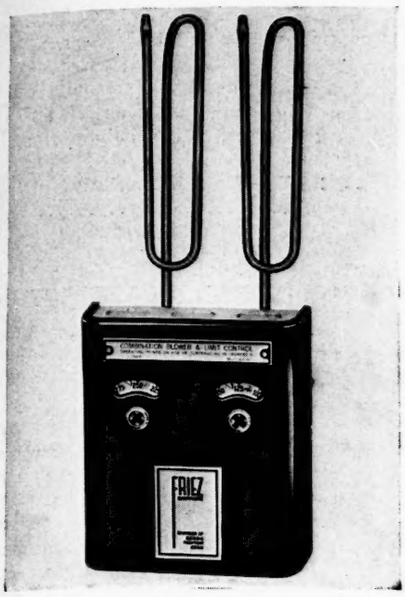
NAME—Ductatherm.
PURPOSE—For the control of temperatures in air conditioning ducts. Also for limit or fan control for warm air furnaces.
FEATURES—The Ductatherm is said to be small in size and easily adjusted by moving a lever over a calibrated dial to the desired operating setting.

Device is actuated by a small bimetal spiral which projects into the duct or chamber where temperature regulation is required. A magnetic sealed mercury contact switch is used. Device is furnished with a standard flat mounting flange and also with an adjustable flange for slope mounting. Designed for use with 24 volts; ranges 50 to 300F and 250 to 500F.
MADE BY—*The Mercoid Corporation, Chicago.* *15*

Minneapolis-Honeywell Indicating Thermometer

NAME—Brown indicating resistance thermometer.
PURPOSE—For indicating temperatures from thermocouples located in any number of points within a building on a central dial.
FEATURES—The manufacturer of this device states that this instrument makes it possible for the operator to easily check on temperatures at all sections of the building. Thermocouples are placed at any location where it is desired to keep a check on the temperature. These thermocouples operate an indicating thermometer located in a convenient central place.
MADE BY—*Brown Division, Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.* *16*



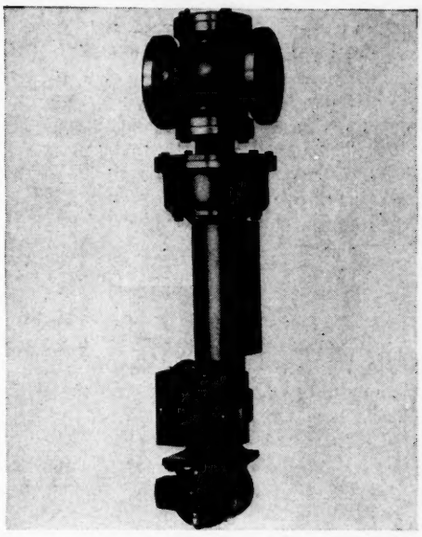


Friez Hydraulic Action Controls

NAME—Friez hydraulic action controls.
PURPOSE—A line of liquid filled hydraulic action controls for heating and ventilating.
FEATURES—These controls are of the solid liquid filled hydraulic action type. The manufacturer states that practically unlimited power gives a new conception of switching mechanism. Controls have a high load carrying capacity (25 amperes at 20 volts, 15 amperes at 240 volts, a.c.) and designed for long service. The fan or warm air limit switch, which is illustrated, is said to have fast sensitivity, adjustable differential and is available in either simple or combined forms, including two speed types for either three or five lead motors. Other controls in this line include warm air limit controls, surface hot water limit controls, immersion hot water limit controls and fan and blower controls.
LITERATURE AVAILABLE — Friez Data Sheet No. 225 and Bulletin LC.
FOR SALE BY—*Julien P. Friez & Sons, Baltimore, Md.* 17

Illinois Flow Control Valves

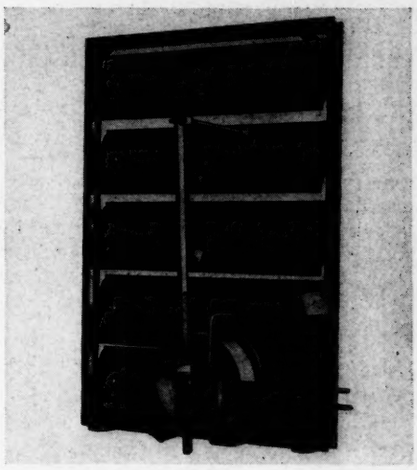
NAME—Illinois Engineering flow control valves, types M, I, L, and A.
PURPOSE—For controlling the flow of steam to heating systems.
FEATURES—These valves are all of the full floating type and are designed to maintain any given pressure above or below atmospheric pressure for which they are set regardless of the heating load variations. The type M is a manual flow control valve which is controlled by a wheel adjustment and has an indicator and adjustable calibrated scale. Type I is a fully automatic motorized flow control valve which is operated by a special integrating thermostat (space temperature responsive). This thermostat causes the valve to operate first in one direction and then in the opposite direction in ½-min. cycles. The thermostat varies the running period of the motor in each direction during each cycle—longer in the direction the demand indicates—shorter in the opposite direction with the resultant integrated movement in the desired direction, either opening or closing the valve. Type L is a semi-automatic motorized flow control valve similar in construction and features to the type I, but operated manually from a remote control cabinet instead of a special integrating thermostat. It is equipped with limit switches for fully open and fully closed positions; also intermediate switches to position the valve for numerous predetermined pressure levels. Type A is a flow control valve pneumatically operated which is controlled by a special infiltration thermostat and a remote control board.
MADE BY—*Illinois Engineering Co., Chicago, Ill.* 18



Type I Illinois flow control valve

Minneapolis-Honeywell Relay

NAME—National Gradutrol relay.
PURPOSE—To eliminate hunting in pneumatic valves and dampers, and by assuring positive air pressure at all times to convert conventional pneumatic control into a system where any degree of graduation is possible.
FEATURES—The manufacturer states that the maximum power of pneumatic motors is made instantly available for adjusting valves and dampers accurately to any one of the infinite number of positions that the graduate thermostats and controllers are capable of demanding. It is further stated that true graduation prevents wide fluctuations caused by varying air velocities or friction in valves and dampers.
MADE BY—*National Division, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.* 19



Jefferson Temperature Control

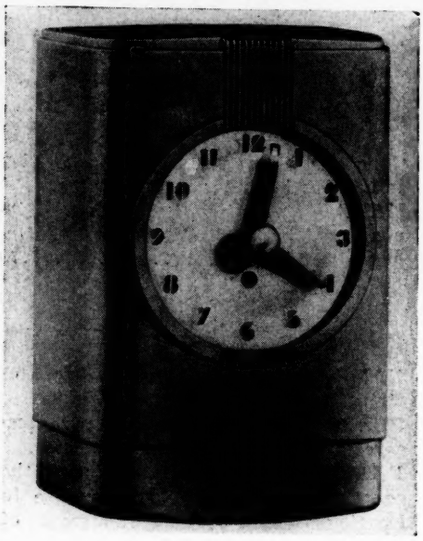
NAME—Concealed adjustment type of air switch control.
PURPOSE—For controlling air temperatures.
FEATURES—This control is of the concealed adjustment type for use in locations where easy adjustment of thermostats is not desirable. The control knob and scale plate are removed from the outside of the enclosing case and the range adjustment can only be made by removing the case. The absence of the usual control knob is said to remove the danger of tampering.
MADE BY—*Jefferson Electric Co., Bellwood, Ill.* 20

Barber-Colman Damper Controller

NAME—Voladjustor.
PURPOSE—For the control of the volume of air delivered by grilles.
FEATURES—This development incorporates advantages and adjustment features of the Volocitrol which has been offered by this company for use in adjusting volumes in air conditioning systems. In addition, voladjustor dampers include a mechanical linkage between the various blades and a connection by flexible shaft to a remotely operated knob or lever. These units are usually inserted in a discharge duct directly behind the grille and by movement of the wall-mounted knob, volumes of incoming air can be adjusted to any amount throughout the range, or the air supply can be entirely shut off. This new device is said to be particularly adaptable to any individual control of cooling supply.
MADE BY—*Barber-Colman Co., Rockford, Ill.* 21

Perfex Thermostat Clock

NAME—Timer clock.
PURPOSE—A separate timer clock for use with the Perfex thermostat to give different day and night temperatures.
FEATURES—This clock can be obtained either combined with the thermostat in one unit or as a separate unit. The advantage of having the clock separate is that it may be installed in any part of the home where it will serve best as a time piece. The clock has a low voltage telechron

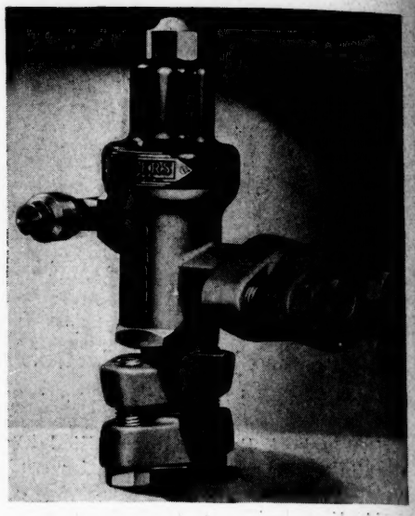


movement. A transformer is supplied at no extra charge to allow it to be operated on a line voltage if desired. The day and night timing periods of operation are set by means of two dials, one on each side of the clock inside the case. The settings are made by turning the two dials to their respective points.
MADE BY—*Perfex Controls Co., Milwaukee, Wis.* 22

Illinois Heating Control System

NAME—Illinois Selective Pressure control system.
PURPOSE—To automatically control the operation of vapor or vacuum heating systems by regulating the pressures maintained and the combustion rate.
FEATURES—This control system consists essentially of a device for regulating the combustion rate such as a Vapor-stat or thermostat, a Selective Controller for controlling the operation of the vacuum pump in accordance with the return line temperature and pressure and a Guide Chart to show the boiler pressure to be maintained for various weather conditions. The Selective Controller automatically operates the vacuum pump to maintain the maximum vacuum possible on the return lines for the temperature existing at the pump. When this is done the maximum differential is maintained between the supply and return main pressures which is said to cause the rapid circulation of steam throughout the entire system to give even heating conditions.

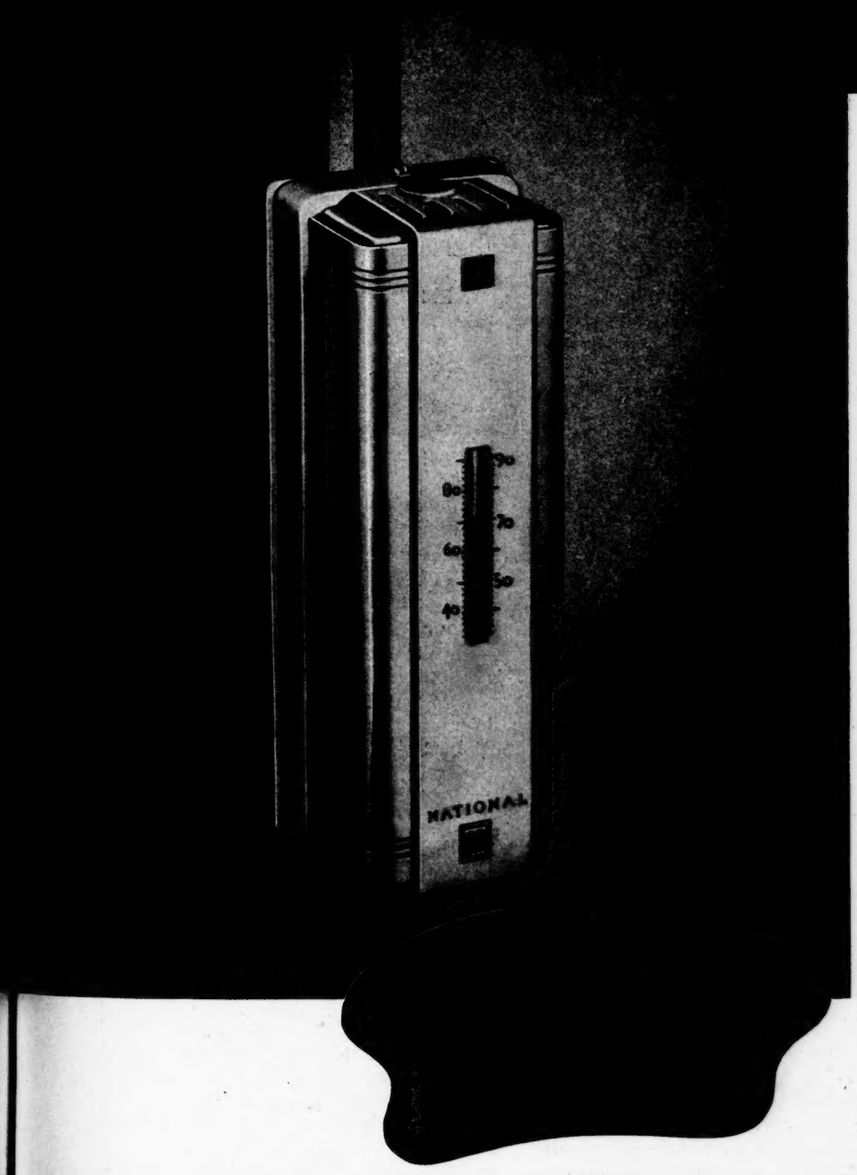
METHOD OF OPERATION—When the heating system is started in the morning both the firing device (oil burner, stoker, blower or like device) and the vacuum pump are put into operation. The vacuum pump quickly drops the pressure in the entire system, including the boiler, to a high vacuum. The returns are cold and the pump continues to operate until the maximum cut-out vacuum is reached when it stops, for example, at 25 in. of vacuum. When the return pressure increases, for instance to 21 in. of vacuum, the pump starts again. Meanwhile, the boiler pressure is rising rapidly and this continues until the boiler radiator pressure reaches the selected boiler pressure, say 1 lb., to take care of morning pickup. Inasmuch as the returns are relatively cool during this heating-up period, there will exist the maximum pressure differential between the two sides of the system. The temperature in the returns gradually rises and the Selective Controller responds to this rise causing the pump to operate between progressively rising pressure cut-in and cut-out points. This continues until the temperature in the returns is stabilized, when the pump will operate for instance from 6 to 10 in. of vacuum for this supply pressure condition. When the building reaches the desired temperature the Vapor-stat is reset for, say, 16 in. vacuum and the blower ceases to operate until the boiler pressure drops to this newly selected level. The returns will gradually cool off as the pressure in the radiators falls and the Selective Controller responds by operating the pump between gradually lowering pressure cut-in and cut-out points until the temperature stabilizes for the new selected boiler pressure and the pump operates from say 21 to 25 in. of vacuum. When weather conditions are mild the Vapor-stat can be turned to the off position so that the blower will not operate at all. The boiler pressure will then drop to the lowest pressure level established by the Selective Controller and under this condition return temperature will probably not be in excess of 70 to 80F. When the pump starts at 21 in. vacuum, the temperature in the boiler will be approximately 157F and as the pump drops the pressure to 25 in. of vacuum where the boiling point is approximately 133F, the sensible heat stored in the water of the boiler will be converted into latent heat of evaporation. This will cause shots of steam to be supplied periodically to all radiators. The radiators will then cool, as the pressure within the system increases to the cut-in pressure and the water in the boiler again stores up heat from the slowly burning fuel until the temperature again reaches 157F.
SIZES—For heating systems of all types of buildings, such as large residences, schools, office buildings, and factories.
MADE BY—*Illinois Engineering Co., Chicago.* 23



Fedders Constant Pressure Valve

NAME AND MODEL NUMBER—Fedders high capacity constant pressure valve, Model HCP-38.
PURPOSE—Designed for use on air conditioning and large commercial refrigeration installations. By accurately controlling the refrigerant pressure it prevents temperature of the room or cooler from dropping too low and by preventing suction pressure in each coil from falling below the desired point makes it possible to maintain the temperature of different evaporators when connected in multiple to a condensing unit.
FEATURES—A convenient adjusting nut makes it simple to secure the desired pressure. Valve is equipped with a shutoff valve for gage. Large refrigerant passageways and 5/8 in. orifices assure minimum pressure drop through valve. Body made of drop forged brass; moistureproof hermetic seal between body and housing prevents valve from freezing.
SIZES AND CAPACITIES—At an 0.8 lb. per sq. in. pressure drop the capacity is 12,000 B.t.u. per hr.; at 2.3 lb., 24,000 B.t.u.; at 5.8 lb., 36,000 B.t.u.; at 13.5, 48,000 B.t.u.; and at 26.7, 60,000 B.t.u. Inlet and outlet connection flanges are standard equipment including tail pipes for sweating tubes of from 5/8 in. to 1 1/8 in. O.D. Inlet and outlet pipe tap, 3/4 in. female.
LITERATURE AVAILABLE—Bulletin 389.
MADE BY—*Fedders Manufacturing Co., Buffalo, N. Y.* 24

A NEW CONCEPTION OF...

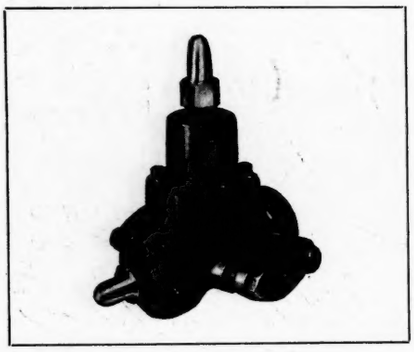


TO the vital subject of Pneumatic Control, Minneapolis-Honeywell has contributed its 50 years of temperature control experience, and countless additions and improvements to the science and art of control. This includes a detailed study of the limitations of all types of Pneumatic Control, resulting in the creation of the M-H Gradutrol System.

The Gradutrol System has brought many vital improvements. The new Helmet Seal Thermostat brings new efficiency and beauty. The exclusive Metaphram construction prolongs indefinitely the life of pneumatic motors. The new Gradutrol principle positively eliminates hunting in valves and dampers, and assures infinite positioning regardless of outside variables.

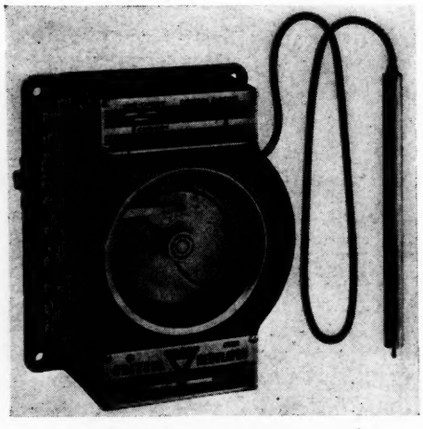
Precision manufacture and simplified design of essential basic units, for universal tailor-made application, plus the nationwide service which has earned for Minneapolis-Honeywell its enviable reputation, make the Gradutrol System outstanding in the field of Pneumatic Control. Yet, with all its advantages over conventional pneumatic control, the Gradutrol System is available at no extra cost. Comparison is cordially invited from Architects, Engineers and interested owners. Minneapolis-Honeywell Regulator Company, 2715 Fourth Avenue South . . . Minneapolis, Minnesota.

MINNEAPOLIS-HONEYWELL *Gradutrol System*



Hubbell Back Pressure Regulator

NAME AND MODEL NUMBER—Back pressure regulator, type SA-2 for ammonia and SF-2 for Freon.
PURPOSE—For maintaining a fixed back pressure in cooling coils of plants using ammonia or Freon as a refrigerant.
FEATURES—Accurate regulation adjustable over a wide range of pressures with variable loads. Flanged connections, tapped for iron pipe size in ammonia valves, or fitted with streamline fittings for copper tube connections in Freon valves. Regulator is said to be compact and has a diaphragm-controlled pilot valve, power piston, and manual opening stem.
SIZES AND CAPACITIES—Made in port sizes from ¾ in. to 8 in. with capacities depending on the refrigerant and its temperature.
MADE BY—*Hubbell Corp., Chicago, Ill.* 25



Marsh Heat Control

NAME—Marsh Unitrol.
PURPOSE—A heat regulating system for intermediate size buildings.
FEATURES—An outside control system which automatically controls the inside temperature according to outside weather conditions. System has been patterned after and incorporates all of the basic principles of the Marsh Tritrol which is used in large industrial plants and buildings. It differs in that it can be installed by the heating contractor, stoker or oil burner dealer. Its design permits accurate adjustment to characteristics of individual heating plants and heating programs desired. The system consists of an outside temperature-responsive bulb and the Unitrol. The outside bulb measures outside conditions and transmits this message by means of a capillary tube to the Unitrol. The Unitrol then determines the time of operation required to satisfy the outside temperature conditions and permits the firing device to operate during this time. On steam systems an aquastat is used for preventing the boiler water temperature from falling too low in mild weather. During the morning the control automatically determines the right time to turn on the heat for that particular day. It determines the duration of the warming-up period for the given outside temperature, and when the building is comfortably warm the heat is turned on and off periodically to meet the outside conditions. As the outside temperature falls, the on periods become longer, and as the outside temperature increases, the on periods become shorter.
MADE BY—*Marsh Tritrol Co., Chicago, Ill.* 26

Air Condition Calculator

NAME—Air Condition calculator.
PURPOSE—For the accurate determination of all of the important properties of air.
FEATURES—This calculator is in the form of a pocket slide rule and is made of a substance similar to celluloid. When two of the following are known—dry bulb, wet bulb or dewpoint temperature—this chart makes it possible to determine all the other properties of the air.
METHOD OF OPERATION—On the front side of the calculator there are two sets of scales. Scales C and D combine the relationship between dry bulb and wet bulb to obtain relative humidity, while scales A and B combine the relationship between dry bulb and dewpoint to obtain relative humidity. The other properties of the air are found on the back of the calculator. Among these are sensible heat, volume, total heat, grains of moisture, latent heat, volume of vapor and the vapor pressure. A table of conversion factors commonly used in air conditioning work is also included.
PRICE—$1.50.
MADE BY—*Calculator Specialties Co., Chicago.* 27

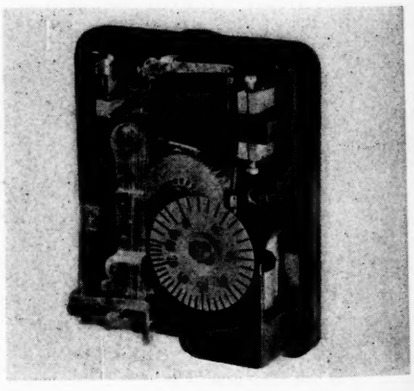
Friez Carbon Dioxide Indicator

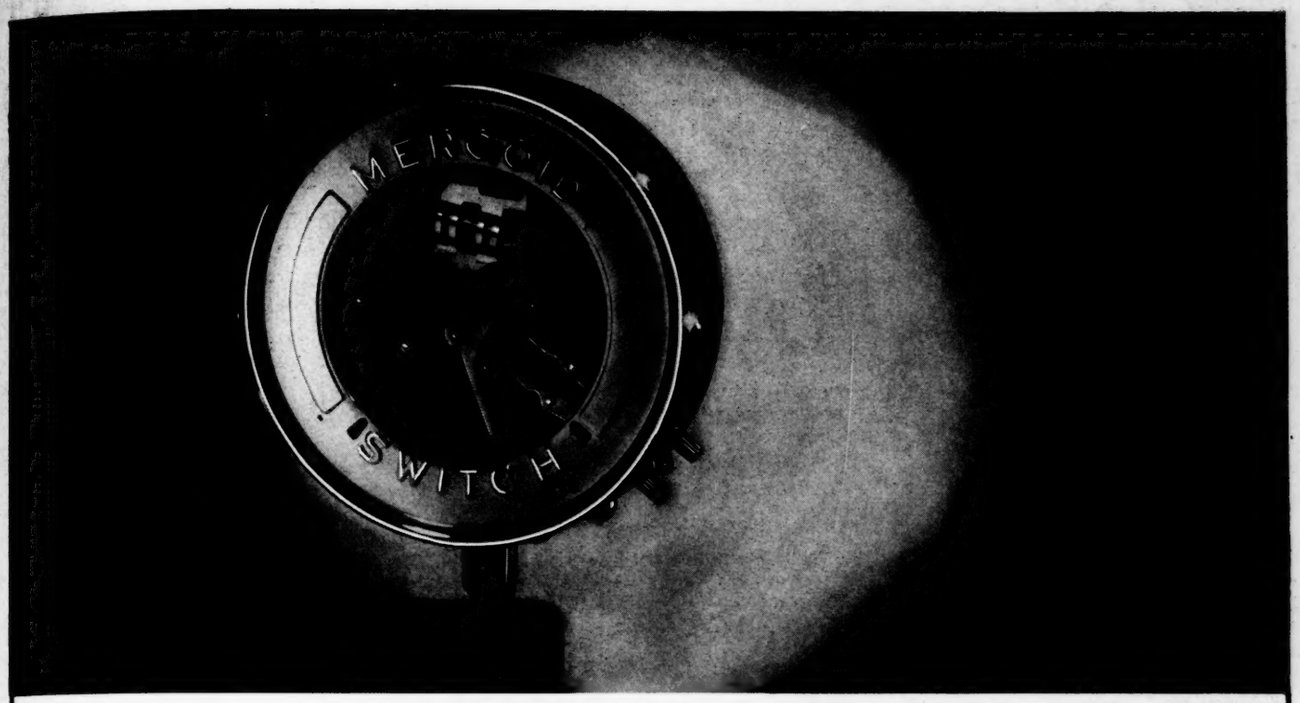
NAME—Friez carbon dioxide indicator.
PURPOSE—For indicating carbon dioxide content of flue gas from coal, oil, or gas heating equipment.

FEATURES—Made of a new transparent composition, strong and durable, and is not affected by the caustic solutions used in the indicator. Device is of a small size. Has polished chromium plated, graduated adjustable scale which eliminates errors of parallax. Readings are obtained by lining up the meniscus of the vertical mercury column with the graduations on the adjustable scale and the reflection of the meniscus in that polished scale. Several hundred readings can be made with a single charge of the solution.
LITERATURE—Catalog Y.
MADE BY—*Julien P. Friez & Sons, Baltimore, Md.* 28

Barber-Colman Micro-Hygrostat

NAME—Barber-Colman Micro-Hygrostat.
PURPOSE—A proportioning type hygrostat for the control of relative humidity.
FEATURES—This Hygrostat is equipped with a device which affords proportioning operation and is designed for use with the Micro system for the control of Microvalves or Microtrols in order to fully proportion the humidifying control medium.
MADE BY—*Barber-Colman Co., Rockford, Ill.* 29





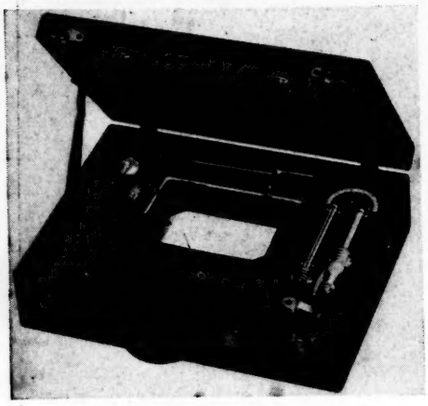
"MERCOID"

IS AN ASSURANCE OF TROUBLE-FREE CONTROL SERVICE

When automatic equipment is purchased, whether for heating, air conditioning, refrigeration, etc., it is expected to function without interruption ¶ The burden of the responsibility for such performance usually rests with the automatic controls ¶ Inasmuch as the comparative cost of controls is insignificant to the whole, it is only wise to exercise the utmost discrimination when selecting controls ¶ "Dependableness" and "long life" have become somewhat hackneyed expressions and yet for want of better words, they truly describe Mercoid Controls. These qualifications are really essential factors in controls ¶ As years come and go in the cycle of time, they either prove or disprove the merits of a product ¶ In the case of Mercoid Controls, each year only confirms their reliability over a long period of years ¶ All Mercoid Controls are exclusively equipped with hermetically sealed contact switches. They are not affected by dust, dirt or corrosion.

THERE IS A MERCOID CONTROL TO MEET YOUR REQUIREMENT. WRITE FOR COMPLETE CATALOG

THE MERCOID CORPORATION • 4201 BELMONT AVENUE • CHICAGO, ILLINOIS

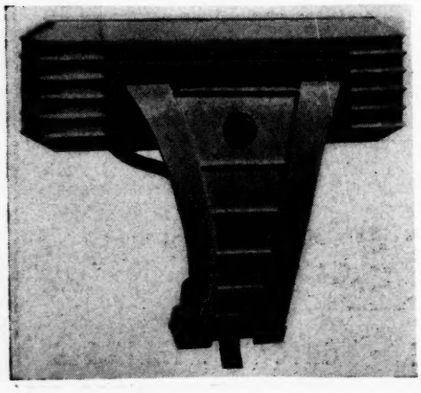


Illinois Test Kit

NAME—Illinois air conditioning instrument kit.
PURPOSE — For measuring air velocities, air volumes, wet and dry bulb temperatures, and flue gas temperatures.
FEATURES — This kit consists of a velometer for measuring air velocities from 0 to 2500 f.p.m., an averaging jet to measure average air velocities in ducts, a sling psychrometer, a water bottle, a high reading thermometer for flue gas temperature measurements, and an air thermometer for measuring grille and register temperatures. Instructions, tables, and the rubber tubing for use with the instruments are stowed behind a hinged cover.
MADE BY — *Illinois Testing Laboratories, Chicago.* 30

Friez Windowstat

NAME—Friez Windowstat.
PURPOSE—To prevent condensation of moisture on windows.
FEATURES—Research at the laboratories of the Friez Company has established that as approach is made to cold surfaces, such as windows in winter weather, the relative humidity of the air rises rapidly, until finally 100% relative humidity is reached at the window itself and then condensation occurs at that point. By placing a specially constructed humidity sensitive instrument (incorporating Friez multiple human hair element) in close proximity to the chilled surface and at the point where its sensitive element is able to detect a dangerously high condition, warning is given of the approach of a condition of condensation. The Windowstat then provides a means of overruling the room humidistat and shutting down the humidifier until such time as further humidity can be added without further condensation occurring. In this way the highest possible relative humidity is maintained without condensation actually occurring on the windows.
MADE BY—*Julien P. Friez & Sons, Inc., Baltimore, Md.* 31



Friez Motor Operator

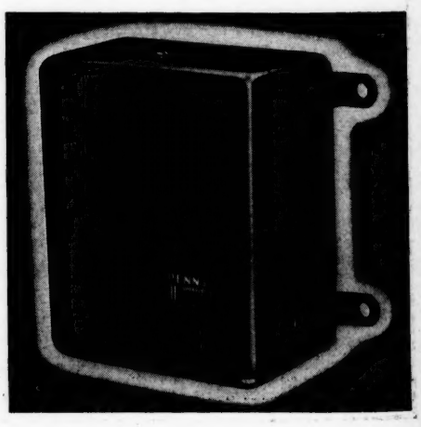
NAME—Friez motor operator.
PURPOSE—An operator to give effect to the automatic control provided by thermostats and other sensitive instruments without using electrical relays.
FEATURES—Motor operator uses a low voltage which is furnished to the control circuit by a transformer which is supplied with each operator. The operators are provided with auxiliary hand switches giving on-off positions and also with arms which are adjustable in position and which are in turn connected to the draft damper of coal-fired furnaces or boilers, to the duct dampers of air conditioners or warm air systems, to zone dampers or like equipment. Many types are available for three-wire or two-wire applications and with built-in or separately mounted transformers.
LITERATURE AVAILABLE — Friez Bulletin VM.
MADE BY—*Julien P. Friez & Sons. Baltimore, Md.* 32

White-Rodgers Hot Water Control

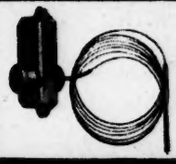
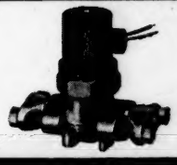
NAME—Dual immersion "hydraulic action" hot water control.
PURPOSE—A control for maintaining both the hot water supply and boiler water temperatures.
FEATURES—This device is said to make it possible to control both the hot water supply and boiler water temperatures with a single instrument. This is accomplished by two separate switches, each having individual thermal element and permitting individual setting. The control utilizes the available tapping in the boiler which makes it unnecessary to drill another hole in the boiler, as is now sometimes required by the use of individual immersion type controls. Each switch has its own individual adjustable differential with ranges of 5 to 35F. Control is available with either vertical or angle mounting. Control utilizes the White-Rodgers "hydraulic action" principle.
MADE BY—*White-Rodgers Electric Co., St. Louis, Mo.* 33

Penn Stoker Timer Relay

NAME AND MODEL NUMBER—Penn stoker timer relay, Type 560.
PURPOSE—For the control of the operation of stokers for motors up to and including 1 hp.
FEATURES—This unit is smaller and more compact than former Penn stoker timer relays. The panel carrying the synchronous self-starting timer, the timer operated cam, the relay and terminals, as well as the new special type air cooled transformer, are all housed inside the case. This control incorporates a low voltage (24 volts) pilot or thermostat circuit using the standard Penn Temtrol of A4 designation. Timer is available for 30 min. or 1 hr. firing intervals when supplied with a 1-hr. timer motor and for 2 hr. and 4 hr. firing intervals when supplied with a 4-hr. motor. The cam units are supplied for one firing frequency per shaft rotation or for two frequencies. Adjustment for length of hold-fire operation may be made from the front of the panel without tools.
MADE BY—*Penn Electric Switch Co., Goshen, Ind.* 34



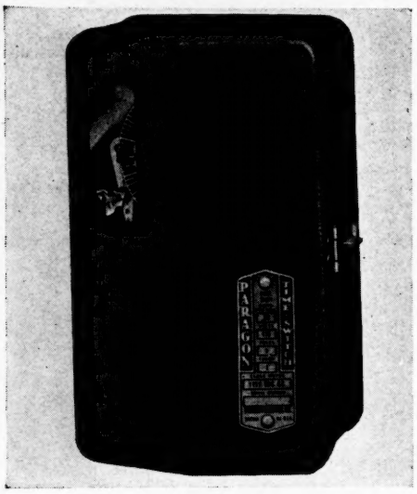
"Genuine Detroit" CONTROLS

WHERE IT IS USED	WHAT IT IS		WHAT IT DOES
In low voltage circuit for summer air conditioning installations.	No. 691 Differential Thermostat		Automatically controls operation of cooling unit to maintain a specified difference between indoor and outdoor temperatures. Prevents "Over-Cooling."
In low voltage control circuits of heating and air conditioning installations.		Two Eleven Room Thermostat	Controls operation of burner motor, Solenoid Valve, damper motor, or Thermotor gas valve in accordance with changes in room temperature.
In low voltage control circuits of air conditioning or humidification installations.	No. 197 Humidistat		Controls the operation of solenoids, motor operated valves, damper motors, relays, heaters, compressors or fans in accordance with changes in humidity.
In the liquid or suction line of refrigerating units and in the water supply line of humidifiers.		No. 683-R3 and 683-W3 Solenoid Valves	Controls the flow of refrigerant or the flow of water in response to action of thermostat, pressure switch or humidistat.
In commercial refrigeration and air conditioning systems.	No. 450 Series Controls for Refrigeration		Controls operation of compressor in accordance with changes in temperature, pressure or vacuum. Available with or without high pressure cutout.
On hot water or steam pipes or tanks.		No. 251 Clamp-On Limit Control	Controls burner, circulator or motor in accordance with temperature changes. Steam and warm air models also available.
In liquid line to evaporator coil of cooling and refrigeration installations.	No. 673 Thermostatic Expansion Valve		Keeps evaporator full of refrigerant at all times, avoids temperature lag and guards against motor overload when starting up a warm system.
Large capacity valve for refrigeration liquid or suction lines or water supply lines.		No. 686 Solenoid Valve (large capacity)	Controls flow of refrigerant or water. Operated by pressure, temperature or humidity control.
In liquid line to evaporator coil of refrigeration and air conditioning installations.	No. 781 Thermostatic Expansion Valve (large capacity)		Keeps the coil completely refrigerated, avoids temperature lag and protects against motor overload when starting up a warm system.

DETROIT LUBRICATOR COMPANY

General Offices DETROIT MICHIGAN

Division of American Radiator & Standard Sanitary Corporation



Paragon Time Switch

NAME AND MODEL NUMBER—Paragon time switch 300 Series.

PURPOSE—A low-priced time switch.

FEATURES—The switching mechanism consists of a back-and-forth snap-action tripping lever activated by the trippers on the Paragon clear-line dial. This can be mechanically operated without changing the automatic switching sequence. The switch construction is of the instant, snap-action type with heavy silver contactors. Rated capacity is 3000 watts per pole. Through a simplified clock train of five cut gears, floating on two fixed arbors, the speed of the heavy-duty, self-starting 450 r.p.m. synchronous motor is reduced to one dial revolution in 24 hr. Prices are said to be from 20 to 25% below the company's standard line.

LITERATURE AVAILABLE—Bul. 3857

MADE BY—*Paragon Electric Co., Chicago, Ill.* *35*

Mercoid Two Stage Thermostat

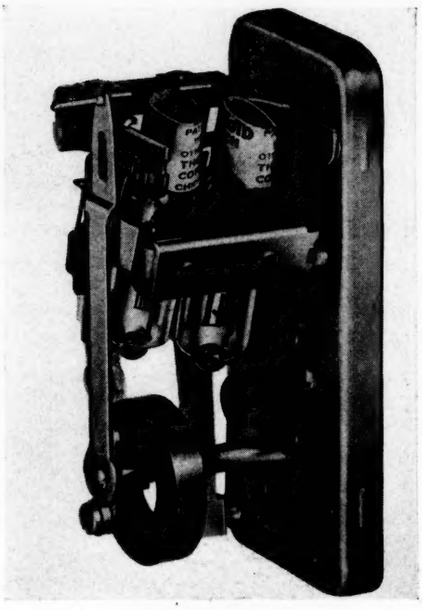
NAME—Two Stage Sensatherm.

PURPOSE—For room temperature control on high-low gas or oil burners, for eliminating overshooting temperatures on stokers on forced air systems and for the regulation of two speed fans on air conditioning systems.

FEATURES—When used with a heating system the control operates somewhat as follows: Assuming that the room temperature is above the temperature at which the instrument is set, two switches in the thermostat will have their circuits open. As the temperature starts dropping the first switch or the one controlling the low fire medium will close. If the low fire is sufficient to cause a rise in room temperature, this low fire switch will then open. When the low fire switch is closed and operating the equipment at low fire, should the temperature continue to drop, the second switch, controlling the high fire medium, will then close. As the temperature rises the high fire switch will open but since the low fire switch is still closed, the heating equipment will then operate on a low fire. On cooling type instruments the operation is the same as above except that the circuits close rather than open on a rise in temperature. Maximum capacity of each circuit is 9/10 of an ampere at 24 volts or less.

LITERATURE AVAILABLE—Bulletin No. B-8.

MADE BY—*The Mercoid Corp., Chicago, Ill.* *36*



Automatic Products Expansion Valve

NAME AND MODEL NUMBER—Thermostatic expansion valve, Model 206.

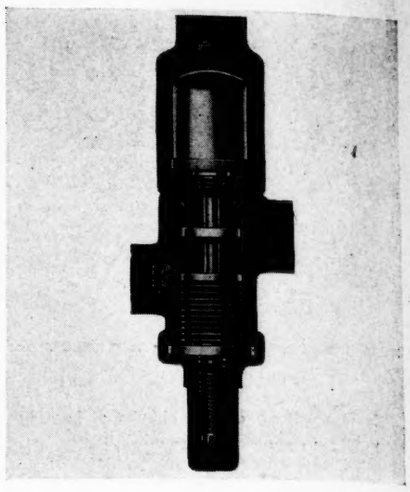
PURPOSE—A thermostatic expansion valve with factory-set superheat for controlling the flow of refrigerant to small cooling units such as spot room coolers.

FEATURES—Has a small body size, a short capillary tube and a small ⅜-in. bulb so that it may be installed in equipment where a limited amount of space is available. It is said that the thermostatic element is liquid charged so that it is possible to install the valve in a temperature either higher or lower than the bulb temperature. The superheat arrangement is factory-set at 10F. Also available with a range from 5 to 15F. The manufacturer states that the use of this valve is limited to systems or evaporators of known capacity and characteristics, because no field adjustments can be made for individual requirements.

SIZES AND CAPACITIES—Furnished in two orifice sizes giving a ¼ hp. capacity on Freon and a 1/3 hp. capacity on methyl chloride or sulphur dioxide.

LITERATURE AVAILABLE—Bulletin 407B.

MADE BY—*Automatic Products Co., Milwaukee, Wis.* *37*



Sterling Mixing Valve

NAME AND MODEL NUMBER—Sterling mixing valve, types 130 and 140-S.

PURPOSE—Mixing of hot water from domestic water heater with cold water from water supply to give any desired temperature between 120F and the temperature of the water leaving the heater.

FEATURES—Temperature is regulated by a sensitive thermostatic member in the mixing chamber at the top of the valve and it is said that the valve will regulate water temperatures between 3F plus or minus. Model 130 is recommended for water of less than 15 grains hardness, is installed in the hot water line, and regulates the supply of hot water to the cold water line. For water of over 15 grains type 140-S is recommended. This valve is installed in the cold water line only and regulates the supply of cold water to the hot water line. The thermostat for this type of mixing valve is a bulb which is inserted in a domestic hot water service line. This valve can be regulated to any temperature from 140F up to the temperature of the domestic hot water leaving the heater.

MADE BY—*Sterling Engineering Co., Milwaukee, Wis.* *38*

Barber-Colman Relay

NAME—Microrelay.

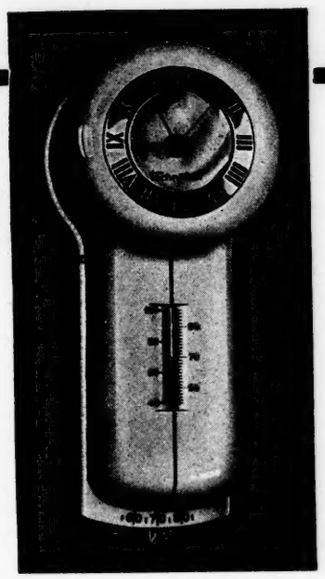
PURPOSE—A relay which when connected between a Microtrol or Microvalve, and a rheostat, will give full proportioning of the controlled unit by the operation of the manual rheostat.

FEATURES—The Microrelay is a unit constructed similar to the Microtherm except that the bimetal element is replaced by a spring under tension. This relay can also be used for many other applications to give full proportioning of control units.

MADE BY—*Barber-Colman Co., Rockford, Ill.* *39*

Quality Materials
Master Workmanship
Reasonably Priced

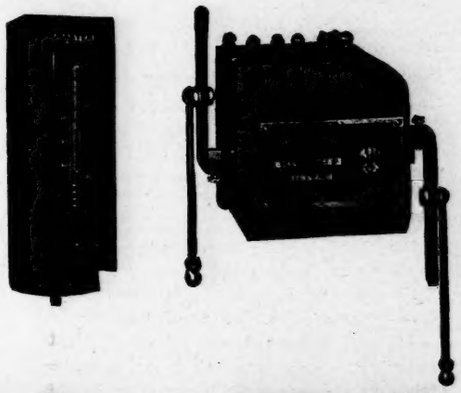
MASTER HEAT REGULATOR



Master builds in accuracy and long life and offers these instruments at the lowest possible price for which such quality and service can be purchased. Whether you are a contractor, jobber, or engineering executive, you get the best and save the most with MASTER PRODUCTS. Sturdily constructed of finest materials—built by experts—backed by over twenty years of growing success in the heat regulator field.

TECHNOTROL

Furnished in Ivory or black molded cases, Technotrol combines distinctive beauty with a fine instrument of precision. Responsive to minute changes in temperature. Technotrol is available in either the Type C-22 two-position model or the famous Type C-144 gradual control model. Also furnished with snap action contacts for 2 or 3 wire low voltage control systems.

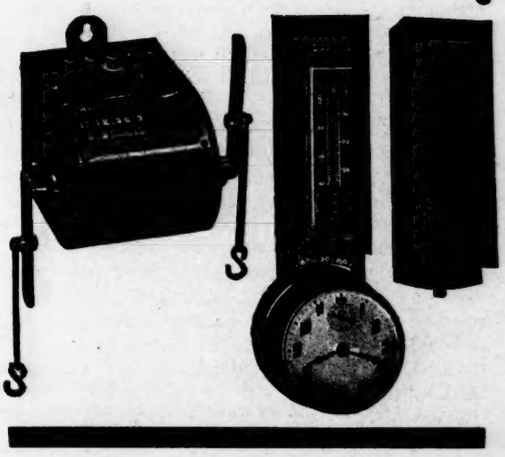


Type B-144 Gradual Control

An instrument of precision, performance and long life, it has four-position smoothness together with the unequalled sensitiveness of Master's patented Thermo-Wafer. Contacts are platinum-iridium. Special non-inductive thermal starting switch requires less than 3 watts. The four-pole induction motor operates at 16 volts through a special low-reactance type of transformer. Listed as standard by Underwriters' Laboratories.

Type B-22 Two-Position

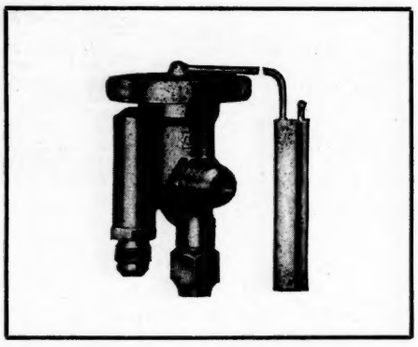
A MASTER instrument with the appearance, accuracy and reliability characteristic of the entire line. Priced for the greatest market of all — moderate salaried home owners. Has fine silver contacts, and 1 degree temperature range response. Motor is quiet with ample power to lift any damper.



In addition to standard line, we furnish quotations on regulators for special applications. We also manufacture the Type B-22-A and B-22-W Limit Controls, and the Master Tripltrol — a control system for warm air plants equipped with blowers.

THE WHITE MFG. CO.

2364 University Ave., St. Paul, Minn.

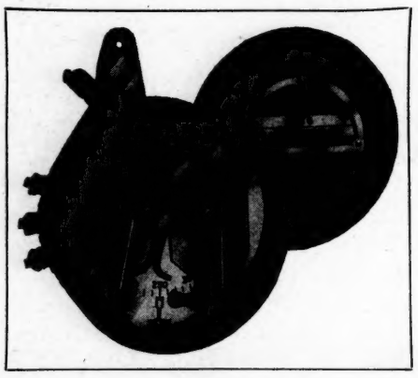


Alco Thermostatic Expansion Valve

NAME AND MODEL NUMBER—Alco thermostatic expansion valve, Type TK.
PURPOSE—For regulating the flow of Freon or methyl chloride refrigerants to cooling coils.
FEATURES—This valve is the smallest T series valve yet designed by the company. It is constructed of all metal and has a stainless steel diaphragm welded to the metal housing. The manufacturer states that the diaphragm construction is such that the maximum strain of motion is at a point remote from the weld. A large filter is incorporated in the valve.
SIZES AND CAPACITIES—Made in a number of sizes with capacities from 0.3 to 5 tons with a 60-lb. pressure difference across the valve.
MADE BY—*Alco Valve Co., Inc., St. Louis, Mo.* *40*

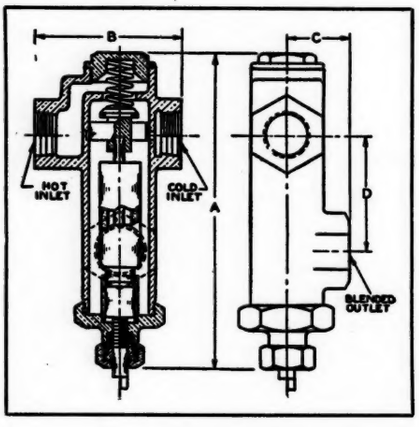
White Control System

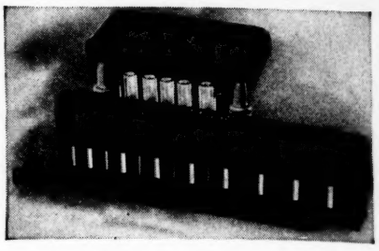
NAME—Master Tripltrol.
PURPOSE—For the control of hand-fired furnaces with blowers or hot water heating systems with circulators.
FEATURES—The set of controls embodies three instruments—a room thermostat, the Tripltrol, and a damper motor with a 110-volt switch for controlling the blower or circulator. The Tripltrol is designed to cooperate with the room thermostat to so coordinate the action of the blower and the draft dampers as to take care of all the changing conditions that may arise either at the room thermostat or in the bonnet of the furnace. The main feature of this system is said to lie in the flexibility of the Master damper motor. This motor will take any one of three positions when the room thermostat calls for heat, moving from one to the other according to the action of the Tripltrol, to suit the ever-changing bonnet temperatures. In one position the draft only is on, in another the draft and fan, and in the third the fan only. A switch on the Tripltrol provides full automatic control of the fan from the room thermostat in the summer. Low voltage is used to simplify the installation and to eliminate all 110-volt wiring from the furnace or boiler.
LITERATURE AVAILABLE—Bulletin No. 900.
MADE BY—*White Manufacturing Co., St. Paul, Minn.* *41*



Sarco Water Blender

NAME AND MODEL NUMBER—Domestic water blender, type DB.
PURPOSE—Mixing valve designed specifically for use on low pressure heating boilers which are equipped with auxiliary hot water heaters.
FEATURES—One inlet of the valve receives the hot water from the boiler or storage tank. Cold water is added to the opposite inlet. The mixed water flows over a Sarco thermostat of the liquid filled type and equipped with a packless seal of Sarco helically corrugated tubing. Water temperature can be regulated between 140F and 180F by means of a special key furnished with the valve. Special ranges built to order. Valve is constructed of brass and bronze.
SIZES—Available in sizes from ½ to 3 in.
MADE BY—*Sarco Company, Inc., New York.* *42*





Taylor pH Slide Comparator

NAME—Taylor pH slide comparator.
PURPOSE—A slide comparator for the colorimetric determination of pH, chlorine and phosphates.
FEATURES—The comparator consists of a slide and a base. Each slide contains nine color standards alternating with ampoules of distilled water. The base contains two vials of indicator solution, with 0.5cc pipettes, five 5cc test tubes and a piece of etched glass in a special compartment. Determinations are made by filling three of the test tubes with the test sample, adding 0.5cc of indicator solution to the middle one, placing the slide on the base and moving it back and forth until the test sample matches one of the color standards. The pH, chlorine or phosphate value is then read off directly from the values on the slide. One base can be used with any number of color standard slides.
MADE BY—*W. A. Taylor & Co., Baltimore, Md.* *43*

TO OBTAIN FURTHER INFORMATION ON 1938 CONTROLS AND INSTRUMENTS

On the list below circle the item number of the equipment in which you are interested, using the number found at the end of each item.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	
30	31	32	33	34	35	36	37	38	39	40	41	42	43	

(This service available only to engineers or executives)

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HEATING & VENTILATING, 148 Lafayette St., New York, N. Y.

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ABSTRACTS of Current Papers, Books and Pamphlets

Design of Industrial Exhaust Systems

The purpose of this book is to tell the engineer how to design and build or how to buy an exhaust system that will adequately and economically perform the functions prescribed by the industrial hygiene expert or by law. Although exhaust ventilation has been practiced for more than 70 years and has been recognized by statute for more than 40 years, the literature is astonishingly scanty. There seem to have been two major contributing factors: First, the field has been relatively small and inconspicuous and has not attracted the attention of colleges and other independent investigators. The second, and perhaps, predominant factor has been that many of those within the industry have treated their accumulated data as precious trade secrets to be divulged neither to competitors nor to customers. The author aims to dispel most of the mystery surrounding exhaust work and to express many of the trade secrets in straightforward engineering terms.

This book covers the following subjects: Flow of fluids; hood forms; air flow through hoods; pipe resistance; piping design; dust separators; low pressure conveyors; centrifugal exhaust fans; structural details and system planning; field measurements and their interpretation.

[*"Design of Industrial Exhaust Systems," by John L. Alden. Published by The Industrial Press, 148 Lafayette St., New York, N. Y. Cloth bound, 220 pages, 5½ x 8½ in. Price $3.*]

●

Aluminum and Silicosis

Silicosis has been classified by some authorities as the leading industrial disease today. One of the most successful methods of prevention of the disease is dust elimination. In far too many cases, however, what is meant to be dust elimination merely turns out to be dust reduction. The high cost of removing the last fraction of dust often results in the fine dust remaining. Many authorities regard this last trace of dust as the most harmful. In an attempt to render harmless this fine material and thereby require elimination only of the more easily and cheaply removed first fraction it has been suggested that certain mineral dusts be added to the air.

The purpose of this paper is to show just why aluminum dust is a protector. A former paper by the authors offered a mineralogic explanation of protectors and since then three other investigators have discovered the protective influence of aluminum and have suggested a different explanation. While the authors accept the conclusion of these three investigators that aluminum is a protector they disagree with the explanation.

[*"Aluminum and Silicosis," by R. C. Emmons and Carl Fries. American Mineralogist, Vol. 23, No. 10, October, 1938.*]

City Surveys

The Department of Commerce has issued a booklet outlining suggestions for use by communities in surveying their city from industrial and commercial standpoints. While the booklet is primarily prepared for the use of community surveys, it is so complete and with so much practical material in it for the guidance of those making a city survey that it will probably be used by all types of market surveyors in making city studies.

[*"Suggestions for Use in Making a City Survey," by Ada Lillian Bush, Chief of the Consumer Market Section, Marketing Research Division, Department of Commerce. 5¾ x 9⅛ in.; 56 pages. Obtainable from the Superintendent of Documents. Price 10 cents.*]

●

BRIEF REVIEWS

AIR FLOW. A simplified method for calculating in the field the volume of air flowing from pitot tube readings. Describes the basis of calculation and gives charts showing how the air density varies with air humidity, how to determine the mean air velocity from various pitot tube readings and the approximate flow of air from the mean velocity. [*"Simplified Pitot Tube Calculations of Air Flow in Ducts and Pipes," by Charles A. Bennett. Published by the United States Department of Agriculture, Bureau of Agricultural Engineering, Washington, D. C. Six pages; mimeographed. Available on application.*]

FLUID FLOW. Pressure losses were determined for nine 4-in. steel, 90° pipe bends of radii from 6 to 80 in. The results are discussed in relation to those found by previous investigators under comparable test conditions. For bends having radii of four pipe diameters or less, all the results which are discussed may be correlated on the basis of pipe roughness. Further data are needed to establish a working formula. No correlation could be obtained for the bends of larger radii. For such bends the maximum published values should be used in engineering work until more comprehensive data become available. [*"Pressure Losses for Fluid Flow in 90° Pipe Bends," by K. Hilding Beij. Research Paper RP1110, Journal of Research of the National Bureau of Standards, Volume 21, July, 1938. Copies obtainable from the Superintendent of Documents, Washington, D. C. Price 10 cents.*]

VENTILATION. A study to determine ventilation requirements for the removal of chlorinated naphthalene fumes from wire-impregnating tanks and to find a suitable trap for catching the sublimation products as near the source as possible to reduce the necessity of frequent cleaning of air pipes and fans. [*"Ventilation of Wire Impregnating Tanks Using Chlorinated Hydrocarbons," by C. P. Yaglou, F. W. Sands and Philip Drinker. The Journal of Industrial Hygiene and Toxicology, Volume 20, No. 6, June, 1938.*]

NEWS OF THE MONTH

Papers on Chemical Dehumidification, Hospital Air Conditioning Features of 34th ASRE Convention in New York

NEW YORK—At the 34th annual meeting of the American Society of Refrigerating Engineers, held here December 6-8, air conditioning, quick-freezing and cold storage all had prominent places on the program. The registration totaled about 500.

At the first session, December 6, Stewart E. Coey, Research Corp., New York, presented a paper on Air Conditioning Featuring Chemical Dehumidification and devoted to a description of his company's calcium chloride dehumidifying system.

The Present Status of Hospital Air Conditioning was the subject of a very interesting talk by Dr. Albert G. Young, Medical Director, Corey Hill Hospital, Brookline, Mass. Doctor Young reports that air conditioning reduces the incidence of post-operative pneumonia and surgical deaths, reduces infant mortality, overcomes immediate attacks of hay fever and asthma in extreme cases and provides the best conditions for the treatment of rheumatic diseases.

According to Doctor Young, the three points to be considered in operating room conditioning are: the best air conditions for the patients, comfort conditions for the staff and avoidance of explosion of the anaesthetics. In general a relative humidity of 50 to 55% is most effective in preventing explosions and consequently this is a limiting factor in operating rooms. Temperatures between 76 and 80F are sufficient but temperatures above 80F are uncomfortable for the staff and there is danger for the patients from perspiration from the staff if the temperatures run above 80F.

In recovery rooms in the Corey Hill Hospital a maximum relative humidity of 35% and maximum temperature of 80F in warm weather are maintained. In cold weather the relative humidity is kept at 25 to 30% and the room temperature at about 76F. These specifications for relative humidity were obtained from outdoor readings of temperatures in May in Phoenix, Ariz., which was believed to be an ideal climate for convalescents.

Premature babies and new-born infants, Doctor Young reported, are maintained under relative humiditics of from 50% to 75% which results in a 0.7% mortality as compared with a 14.5% mortality when the relative humidity was between 25% and 49%. The normal or full-term infant after the first 48 hours is transferred to the regular nursery for normal infants where a temperature of 75F and a relative humidity of 30% to 40% is adequate.

Doctor Young stated that allergy or hypersensitivity may be caused by bacterial infection, diet, deficiencies of the system or inhaled substances. It is only the latter group of cases which are subject to improvement by air conditioning. Here, however, air conditioning can be of great benefit and Doctor Young recommends that an isolated section of the hospital be chosen for these patients with double doors used to exclude pollen. A rigid rule of no flowers is enforced here. All exhaust ducts must be one way ducts and windows must be double sashed and sealed. The values of temperature and humidity are not too important but constancy of both is of some importance since allergic patients are unable to adjust their bodies to sudden changes of humidity.

In the United States there are at any time 840,000 cases of rheumatic fever which cause at least 40,000 deaths annually. These cases account for more than a third of the crippled hearts in adult life and so far have stubbornly resisted treatment. About the only treatment that the medical profession knows for rheumatic fever aside from bed rest is consistently warm dry climatic conditions.

Doctor Young concluded his paper by saying that while air conditioning is an added expense to the hospital he believes that the results far outweigh this increased cost and believes that eventually air conditioning will become as universal in hospitals as central heating plants.

Air Pollution and Its Relation to Weather was the subject of a paper by David R. Morris of the New York Meteorological Observatory in Central Park. Doctor Morris showed by slides the hourly and weekly variation in smoke in Central Park and described the method of obtaining smoke production data.

In the afternoon of December 6 a conference on market research was held under the direction of John F. Stone. The question considered was: What Economic Data are Most Needed in Refrigeration? Included among those discussing this subject was E. C. Hughes of the National Electrical Manufacturers Association; A. B. Schellenberg, sales manager, Alco Valve Co.; Clifford Strock, associate editor, HEATING & VENTILATING; David L. Fiske, secretary of the ASRE; Luis Gibson, advertising, George H. Gibson Co.; A. H. Baer, and others.

The Wednesday morning session on refrigeration in industry was opened by C. T. Baker, vice-president of the ASRE as chairman. The first paper was presented by John R. Monsell and was entitled "Air Conditioning at Low Temperatures in Aircraft Engine Laboratories." According to Mr. Monsell the most important use of cold air in any aircraft engine testing laboratory lies in supplying the proper conditioned air for power calibration of engines. When used for this purpose the conditioning system must be capable of cooling the carburetor entrance air to at least —30F. Other uses for low temperature air are for determining the proper carburetor size to provide the correct fuel flow under all conditions and for testing the ability of engine starters to rotate engines which have been cooled to extremely low temperatures.

Of considerable interest was the paper by R. H. Heilman and R. A. MacArthur on Metal and Asbestos Ducts in Air Conditioning Systems. This paper gave the results of tests conducted to determine the friction losses, the comparative heat transmission characteristics and the sound characteristics of both types of ducts. A large number of the members, including W. H. Carrier and J. G. Bergdoll, discussed the paper. Other papers on the morning session were Trends in Compressor Design by H. C. Guild, and Laboratory Aspects of Low Temperature Refrigeration, by A. V. Ritchie, N. H. Hiller, Jr., and A. F. Brewer.

FHA Stiffens Burner Rules in N. Y.

WASHINGTON—On or about January 1 a letter of instructions will be issued by Federal Housing Administration to its offices located in Jamaica, New York City, and White Plains, N. Y., stating that on all new construction commitments made February 1 or thereafter in these territories performance tests together with a certification of the results, manufacturer's warranty and a service guarantee with respect to all oil burner installations will be required.

If this program proves successful it is expected that the knowledge gained from this experience will materially aid in making it possible to extend its application nationally.

Elect New Officers at Pittsburgh

PITTSBURGH—The ASHVE Pittsburgh chapter celebrated a Christmas Party at its regular monthly meeting December 7 held at the Fort Pitt Hotel. Robert A. Miller, Jr., was initiated as president of the chapter succeeding J. F. Collins, Jr. Other officers of the chapter are F. C. McIntosh, vice-president; Leon S. Maehling, treasurer; and Theo. F. Rockwell, secretary.

Furnace Men Plan Publicity Effort at Cincinnati Convention

CINCINNATI—The silver anniversary convention of the National Warm Air Heating and Air Conditioning Association, held here December 12-14, was one of the largest in the history of the organization, with an attendance of approximately 500. A program mapped out for the coming year included plans for continuing the engineering research at the University of Illinois and for merchandising the results of this research, which have cost the association to date nearly $200,000.

Pres. L. R. Taylor and all the other officers and directors were re-elected.

William E. Darden, new assistant to the president of NWAH &ACA

The executive staff was increased by the engagement of Wm. E. Darden of New York to serve as assistant to the president. Mr. Darden will spend most of his time calling on the trade, building up membership, advising manufacturers and distributors and promoting the interests of the industry in other ways approved by the board of directors.

A report on the Association's sales development and publicity campaign begun last October was given by H. T. Richardson, New York, chairman of the Publicity Committee and Allan P. Ames, New York, of the agency in charge of the campaign.

The main theme of the technical addresses was the new opportunity for business presented by the development of air conditioning and forced air heating. Addresses relating to this topic were delivered by Perl S. Miller, Columbus, Ohio, on Standardization and Use of Prefabricated Ducts; L. O. Monroe, of Detroit, secretary-treasurer of National Association of Fan Manufacturers, on The Standard Test Code for Fans; G. W. Denges, Cincinnati, on Continuous Blower Operation.

Prof. A. P. Kratz, head of the department of engineering research at the University of Illinois, who is in charge of the research at that institution financed by the Association, gave a talk illustrated with lantern slides on Significance of Resistance in a Forced Air System. Profs. S. Konzo and R. B. Engdahl, who are associated with Professor Kratz, also made illustrated talks. Professor Konzo spoke of the summer cooling studies at the "Research Residence" at Urbana and outlined the work that lay ahead in providing a scientific basis for the use of warm air heating equipment in connection with residence cooling.

The report of the research and advisory committee was read by Mr. Denges, who has recently been appointed a member of that committee.

Other speakers were: Charles P. McCormick, president, McCormick & Co., Baltimore, Multiple Management; B. F. McLouth, Lansing, Mich., Activities of Our Installation Codes Committee; Harold D. Comey, Cincinnati, FHA District Director, FHA's Contribution to Industry; A. W. Wrieden, Syracuse, N. Y., Contented Customers; J. Earle Maynard, Elyria, Ohio, Our FHA Relations Committee; Charles B. Hook, Middletown, Ohio, president, American Rolling Mill Company, The Maintenance of the Private Enterprise System; H. R. Rost, Cincinnati, The Use of Coke with Warm Air Equipment.

In celebration of the Association's silver anniversary 25 candles in five silver candelabra were lighted in front of the speakers platform at the opening session. Seated behind the candles were the following past presidents all of whom gave brief summaries of their administration: W. G. Wise, 1918-21; Irving L. Jones, 1921-23, 1931-32; W. L. McGrath, 1932-34; H. T. Richardson, 1934-36; W. L. Rybolt, 1936-38. Letters were read from D. Rait Richardson, President, 1917-18, and E. B. Langenberg, 1923-27.

An enjoyable feature of the opening meeting was the presentation of 300 silver dollars and a silver pencil to the Managing Director, Allen W. Williams, who has held this office since the founding of the Association.

On Tuesday evening all those who registered at the convention were the guests of the Williamson Heater Company and the American Rolling Mill Company at a banquet in the Pavilion Caprice at the Netherland Plaza Hotel. Joseph A. Stermer of the Williamson Company was director of festivities.

At the convention it was announced that 63 furnace manufacturers and manufacturers of accessories and supplies had subscribed to the publicity campaign.

Naval Vessel Heating Described

SEATTLE—At a recent meeting of the ASHVE Pacific Northwest chapter, Lieut. Com. C. F. Chisholm talked on Life on Submarines where the heating and ventilating problem is a major one uniquely solved. Lieut. Com. John Conner gave a colorful talk on Experiences Aboard Naval Vessels. Ray Wardell spoke on Racial Psychology.

Hendrickson Returns to Institute

CHICAGO—After an extended leave of absence, during which he was actively engaged in designing, laying out and installing air conditioning and heating systems, R. L. Hendrickson has returned to his old post as chief engineer of the Utilities Engineering Institute.

Engineers are Remakers of Man, Dr. Haggard Tells ASME

NEW YORK—Engineers, by changing the environment in which man lives, also change the physiological reactions of his body, with consequent psychological changes affecting his entire personality, Dr. Howard W. Haggard, director of the Laboratory of Applied Physiology of Yale University, told the annual convention of the American Society of Mechanical Engineers held here December 5-9.

Professor Haggard delivered the Robert Henry Thurston Lecture at the annual dinner of the society at the Hotel Astor, one of the features of the program of the engineers' 59th annual meeting.

"There is no isolated, no separate, no independent part of the body," Doctor Haggard said. "The body operates only as a whole. When the engineer creates or controls environments in which the body is to operate, any change in any one feature of the environment affects the body as a whole. And, furthermore, the effect on the body alters its reactions and tolerances to all pre-existing conditions in the environment.

"Thus, to be specific, air conditioning is not limited in its physiological effects to its influence upon heat-regulating mechanisms of the body. Instead it alters the body as a whole, in every one of physiological as well as psychological functions. Because of these changes the man's reactions are changed to all sorts of situations and influences that existed before air conditioning was introduced. From one change in his environment he becomes a changed man.

"In every such problem of engineering there is this physiological factor. And my hope is that the engineer will recognize this factor and give it its proper consideration. I hope then that he will learn some physiology and in so doing learn to know the human body, not in terms of engineering practice or as isolated functions, but with a broad understanding of those peculiarities which are imposed by the phenomenon of life."

Buensod-Stacey Firm Celebrates

NEW YORK—As an informal celebration of the third anniversary of the firm, Buensod-Stacey Air Conditioning, Inc., entertained its entire personnel and friends and clients at dinner at the Downtown Athletic Club on December 12. The Buensod-Stacey firm, formed by A. C. Buensod, A. E. Stacey, Jr., and M. S. Smith, well-known throughout the industry, has enjoyed rapid growth and has executed some of the largest and more important contracts on air conditioning in the New York Metropolitan area and also throughout the country.

A.C. Training Discussed by ASME at 59th Annual Convention

NEW YORK—The 59th annual meeting of the American Society of Mechanical Engineers held at the Engineering Societies Building here December 5-9 attracted an attendance of nearly 3000 men interested in the long list of papers which covered subjects as diversified as machine tools, steam power, aeronautics, management, construction, textiles, hydraulics, and railroads. The Power Show held at the Grand Central Palace during the same week was a coincident attraction.

Besides the technical sessions held daily the program included a business meeting on December 5, several luncheons and dinners, Honors Night on Tuesday, and the annual dinner on Wednesday, December 7.

At a session devoted to education and training, Ray D. Smith, president, Refrigeration and Air Conditioning Institute, presented his paper Industrial Training in the Air Conditioning Industry. Mr. Smith held the close attention of his audience while he outlined the kind of training offered to men in this industry. Since the Institute is the only one of its kind in existence a description of the work offered proved to be of such interest that Mr. Smith had to answer many questions on specific points raised by those in attendance.

As a feature of the session on Safety, Hylton R. Brown, U. S. Department of Agriculture, prepared a paper on Control of Dust Explosions in Industrial Plants. As a result of experiments made in a test structure in Washington Mr. Brown indicated that in order to vent dust explosions it was necessary to provide a venting area of 1 sq. ft. for each 80 cu. ft. of volume in a cubical-shaped room when grain dust was the explosive material. Other studies indicated that approximately 3 sq. ft. of venting area for each 100 cu. ft. of volume is required to vent safely an explosion of starch dust in a room of similar shape. He also indicated that glass can be used to advantage to cover a venting area provided ordinary glass is scored properly so that it will break readily under the pressure generated by the explosion. In connection with vents for particular kinds of equipment he indicated that the usual type of dust collector should probably have a vent area of not less than 1 sq. ft. for each 30 cu. ft. of volume. His test data also indicated that it was a matter of considerable importance to locate the vents as close to the point of origin of the explosion as possible.

Another paper of interest to men engaged in heating and ventilating was Pulsating Air Velocity Measurement by Neil P. Bailey which was prepared for the Fluid Meters session Thursday morning.

Sound Control Subject of Meeting

BOSTON—An interesting program characterized the December 14 meeting of the Air Conditioning Bureau at the Edison Auditorium. John A. Chambers, district manager of the acoustical department, Johns-Manville Sales Corporation of Boston, was the first speaker, taking for his subject Sound Control of Air Conditioning Equipment. With it he showed a sound picture on Fundamentals of Sound.

The second speaker of the evening was H. H. Scott, from the engineering department of the General Radio Co., Cambridge, Mass., who spoke on Description and Demonstration of Sound Measuring Equipment, with a sound level meter reading directly in decibels also being demonstrated.

Plans have already been developed for the January meeting, to be held on the 12th. Charles Penrose, senior vice-president of the Newcomen Society, will be the guest speaker, addressing the meeting on Industry's History. This meeting is expected to be exceptional in attendance, for participating organizations will include the Associated Industries of Massachusetts, the Boston Chamber of Commerce, and several other industrial groups, as well as the various engineering societies and the Real Estate Exchange, the Boston Oil Burner Associates, electrical societies, and others.

Illinois Schedules A. C. Conference

URBANA, ILL.—A conference on air conditioning, to be sponsored by the Department of Mechanical Engineering and the Engineering Experiment Station of the College of Engineering, University of Illinois, has been scheduled for March 8-9, 1939. The purpose of the conference is to present technical information on current problems and apparatus involved in small and medium size all-year comfort air conditioning installations, in as non-technical a manner as is possible, in order to serve the small dealer, installer, owner, and prospective owner of air conditioning equipment.

The papers to be presented will cover modern equipment, design of duct systems and selection of fans, air distribution in spaces, regulation of air temperature and humidity, physiological information, refrigeration and condensation problems, insulation types and applications, and water supply, conservation, and disposal problems. The air conditioning equipment in the laboratories of the University will be available for inspection at convenient periods following the afternoon sessions.

There will be no charge for either registration or attendance. Complete information is obtainable from Prof. W. H. Severns, University of Illinois, Urbana, Ill.

Power Show in N.Y. Attracts 42,000 Who View 280 Exhibits

NEW YORK—The 13th National Exposition of Power and Mechanical Engineering was held at Grand Central Palace here December 5-10. More than 280 exhibitors showed their products on three floors of the Palace to a total registered attendance of nearly 42,000 visitors. This represents an increase of almost 10% over the 1936 exposition.

The outstanding success of this year's presentation of power and mechanical engineering equipment was shared equally by the exhibitors, who had carefully prepared informative displays, and by visiting manufacturers, engineers, factory superintendents and industrial specialists who took lively interest in the new products and methods on exhibition.

Outstanding among the exhibits was a full-size water-cooled stoker incorporating radically new design features. This large operating exhibit was erected at one end of the main floor and attracted a steady stream of visitors.

A boiler-burner combination for use with No. 6 oil, fully automatic, was shown. A viscosity valve regulates the amount of oil burned regardless of changes in viscosity of the oil. A boiler water control was shown that eliminates floats and valves operating in the steam; it is intended primarily for boilers of 150 hp. and smaller.

Instruments and controls, featuring new developments and unique applications, attracted wide attention. Working models of control panels demonstrated the latest methods of completely automatic control by means of electrically transmitted impulses. Magnetic liquid level gages for atmospheric and pressure tanks up to 400 lb. pressure also were shown. The magnetic action together with the use of a brass forged head makes possible an absolutely tight head. The claim is made that even though the glass crystal and dial be shattered by a sharp blow, no leakage can develop.

One exhibitor of steam traps demonstrated his products by means of a complete power plant assembly, including boiler, reducing valve, load, trap, open receiver and pump. The display consisted of an electrically-operated boiler completely enclosed, generating steam at 20 lb. pressure, reducing it through a reducing valve to 10 lb. pressure, condensing about eight pounds an hour. The condensate flowed through the trap from an open receiver from which a float-operated, motor-driven pump returned it to the boiler.

Heating and ventilating equipment was well represented by industrial ventilating fans, attic fans, unit heaters, and portable conditioners, many of which were demonstrated in operation.

Engle Heads District Heat Section

BOSTON—At the fall meeting of the Boston section, National District Heating Association, held November 30 at the Engineers' Club, the following officers were elected for 1939:

Chairman, M. D. Engle, advanced from vice-chairman; vice-chairman, L. K. Spink; treasurer, C. V. Fry, manager Cambridge Steam Company; secretary, M. A. Ulbrich; executive committee, Ralph Franklin, Harold Coombs, E. A. Edwards and D. F. Kavanagh. Speakers' committee, D. H. Little, chairman; membership committee, J. W. Bolton, chairman.

Following election of officers, the following led discussions of various reports presented at the national convention in Baltimore: distribution, A. L. Dutton, Boston Edison Company; commercial relations, R. M. Nee, Boston Edison; meters and accessories, E. A. Edwards, American District Steam Company; sales development, M. A. Ulbrich, Cambridge Electric Light Company; research, G. K. Saurwein, Harvard University.

New Course Announced by Harvard

CAMBRIDGE, MASS.—Announcement is made at Harvard University of the establishment of a new undergraduate department of architectural science, to open next fall. New additions to the staff include Dean Hudnut, Marcel Breuer, and Martin Wagner.

Problems to be considered in the Harvard school will include not only building construction but construction methods that take into proper consideration the modern problems of heating and air conditioning.

Requisites for the degree in the new undergraduate courses, to be limited to 45 honor students, will include courses in experimental physics, mechanics, descriptive geometry, architectural design, history of architecture and planning.

In the graduate school emphasis will be upon practical construction work, with a requirement of six months actual experience in professional work on construction, rather than office problems. Thus the students will gain first hand knowledge of the relation of general architectural problems to the engineering problems connected with heating and air conditioning systems.

New Plant and A.C. for Hospital

PHILADELPHIA—St. Christopher's Hospital for children, 2600 North Lawrence Street, dedicated a new unit and nurses' home November 30. Among other improvements to the existing plant the new unit provides for a central heating plant, and new air conditioned operating rooms.

Lewis Addresses Chicago Chapter on Air Conditioning Troubles

CHICAGO—S. R. Lewis, consulting engineer, was the speaker of the evening at the monthly meeting of the ASHVE Illinois Chapter November 14. One hundred and twenty attended. Mr. Lewis' subject was A Heating and Cooling Man Discusses His Troubles.

According to Mr. Lewis, the lack of adequate zoning to compensate for variations in occupancy and heat reception from manufacturing processes, and failure to provide not only ample access doors but also sufficient clearances to make the doors easily usable for maintenance, will often prove sources of complaint.

Use of well water, he said, for precooling and condensing purposes will result in large savings in both first and operating costs but thought should be given to the possible presence of corrosive impurities such as hydrogen sulphide in such water supply, which may cause leaks in condenser tubes resulting in loss of the refrigerant and flooding of the system. If such impurities are present, the answer would seem to be to limit the use of this water to precoolers and to use evaporative condensers with city water makeup to accomplish condensing.

Mr. Lewis pointed out that in original design it is not enough to work toward the intended or existing conditions. Account must be taken of changes in use of occupancy of conditioned areas, as in the case of a department store in which the basement and first floor were supplied from a common central fan system. The heat gains indicated that air supplied at the same temperature would maintain both spaces at the proper conditions, and this was actually the case during the first summer of operation. However, before the second summer, the owner, finding the basement was comfortable and attractive, proceeded to double the illumination and to attract many more people. As a result, when the basement was now maintained at a comfortable temperature, the first floor was entirely too cool. The solution in this case was to install an entirely separate supply system for the basement which could have been done at the start as easily as not.

The speaker brought out many other points including the necessity of adequate exhaust to keep down odors; fresh air intakes of sufficient size to permit the use of all outdoor air to take advantage of the many days when outdoor conditions are nearly perfect; use of reheater coils for small private offices supplied from central systems; conversion of antiquated or improperly maintained vapor heating systems to force hot water; construction of tighter or leakproof fresh air dampers; elimination of short abrupt duct connections at fans.

Prentis Elected President of ASA

NEW YORK—William L. Batt, president of SKF Industries and president of the International Management Conference, was guest speaker at the annual meeting of the American Standards Association held November 30 at the Hotel Astor here. This meeting marked the twentieth year of ASA's activities as national clearinghouse for the standardization work of American industry.

Prior to Mr. Batt's address Dana D. Barnum, retiring president of ASA, welcomed the following six trade groups that have in the past twelve months become members: Copper & Brass Mill Products Association, Outdoor Advertising Association of America, Anti-Friction Bearing Manufacturers Association, Gypsum Association, U. S. Wood Screw Service Bureau, and U. S. Cap Screw Service Bureau, bringing the basic membership to 71 national trade associations, societies, and government departments.

Eight new standards projects were started during the past year, four in the building field, one for the development of adequate standards for bedding and upholstery, one in the field of photography, and two in the safety field.

The following new officers of the American Standards Association were elected at the meeting: president, Edmund A. Prentis of Spencer, White & Prentis, New York; vice-president, R. E. Zimmerman, vice-president, United States Steel Corporation; chairman, standards council, F. M. Farmer, vice-president, Electrical Testing Laboratories, New York; and vice-chairman, standards council, R. P. Anderson, American Petroleum Institute, New York.

Unit Heaters Ordered for Airport

NEW YORK—To heat the 33,000,000 cu. ft. in the seven hangars now building at the $30 million North Beach airport, near the World's Fair site on Long Island, 30 large unit heaters have been ordered by the City of New York at a cost of over $161,000.

The great size of these hangars, combined with the extreme drafts experienced when hangar doors are open, has made this an outstanding problem for the heating engineers connected with the airport. The Lee heaters selected for the job each have an hourly output of 3,150,000 B.t.u. Thirty of these are used, their combined output being close to 95,000,000 B.t.u. The installation includes over 7,500 ft. of underground ducts through which fans distribute the air to the buildings.

This airport development, the largest in the world, was planned by Delano & Aldrich, architects, and Syska & Hennessy, consulting engineers, of New York.

Crane Holds Open House at Labs

CHICAGO—Research work which goes on behind the scenes in the plant of a large manufacturer of valves, fittings, plumbing and heating equipment and pumps was revealed at an open house held by Crane Co., at its Chicago works in the middle of November. The occasion was inspired by a notable expansion in the Crane research and engineering program.

Research work by Crane has been continually expanded in recent years until today it occupies two two-story buildings with a floor space of 86,000 sq. ft. and a personnel of 285. The staff ranges from experts in metallurgy to specialists in the field of ceramics.

The work in metallurgy, which probably is the biggest single activity in the laboratories, is highly important because the company manufactures 45 non-ferrous and 12 ferrous alloys. A miniature foundry is part of the equipment for carrying on this work.

A 400,000 volt X-ray enables research workers to examine metals to a maximum depth of 10 in. although for practical purposes 5 in. is about as far as the instrument will penetrate.

In the industrial laboratory valves, fittings and fabricated piping are subjected to tests as high as 50,000 lb. per sq. in. with strain gages located to determine the amount and location of strain. Other observations made in this laboratory are high temperature tests, service tests, flow of fluids and pipe bends.

In the thermal laboratory there is complete equipment for the examination of devices for insuring maximum comfort from heating systems. A cold room is maintained for testing equipment, a 12-ton ice machine assisting in this work. Temperatures in a test room can be examined at 100 different points by means of remote control.

Other branches of the laboratories include those on chemistry, physics, and photography.

Fire Hazard of A. C. Discussed

DETROIT—The ASHVE Michigan Chapter held its regular monthly meeting December 12. The first speaker of the evening was R. C. Loughead, chief inspector of the Michigan Inspection Bureau, who described the features an air conditioning system should have in order to make it free from fire hazard. He pointed out that recent fires in ventilating systems could have been prevented if these provisions had been included. The talk was then discussed by Otto Lindemeyer, fire marshall of the City of Detroit.

The second speaker of the evening was George F. Emery, chief inspector, Bureau of Buildings and Safety Engineering, City of Detroit, who discussed the proposed air conditioning code for Detroit.

Stacey Addresses Ontario Group

TORONTO—The principal speaker at the December meeting of the ASHVE Toronto, Ont., chapter was A. E. Stacey, Jr., of Buensod-Stacey Air Conditioning, Inc., New York. He gave an interesting illustrated talk on Air Conditioning in Industry.

Harry H. Angus, chairman of the code committee, reported that the code for steam and hot water heating of residences up to 50,000 cu. ft., had been completed and turned over to the board of governors. The code for gravity and forced warm air heating is to be discussed at the January meeting.

The nominating committee reported that the Ontario chapter's representatives on the Nominating Committee at the coming annual meeting of the ASHVE at Pittsburgh, would be Harry R. Roth, the society's secretary, with C. Tasker as alternate.

OBI Amends By-Laws, Reduces Dues

NEW YORK—A program designed to make the Oil Burner Institute more broadly representative of, and better able to be of constructive service to, the oil burner industry as a whole was established by the OBI board of directors at a special meeting here December 8.

Reduction of dues and more liberalized qualifications for membership were decided upon as the first steps toward an improved competitive position for the oil burner industry in the general field of automatic heating.

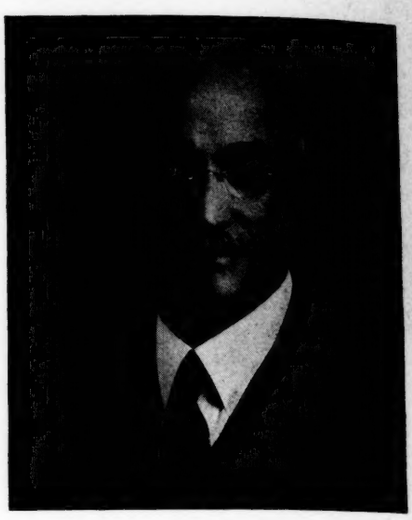
By-laws have been amended to provide that any reputable person or corporation may become a member of OBI provided they have an original listing with Underwriters' Laboratories, Inc.

Revised dues for manufacturer members are $150 per year and for associate members $100 per year, effective March 1. Applications for memberships received before March 1 will be on a no-dues basis, provided these applications are accompanied by ad interim payment of half the dues for the ensuing year.

Warren Webster

CAMDEN, N. J.—Warren Webster, 75, president and general manager of Warren Webster & Co., Camden, died of complications in Georgetown University Hospital, Washington, D. C., December 21. Mr. Webster was known throughout the heating industry for his pioneering work in vacuum steam heating.

As late as 1880, the prevailing theory of steam circulation in heating and ventilating practice was that there should be an equal pressure throughout the entire system, boilers, piping and radiators. In 1882, Warren Webster



Warren Webster

acquired the Williames patent which introduced a fundamentally new theory. With steam circulation maintained in a definite direction, the pressure on the return side is always definitely lower than that on the supply side. This was the new and simple idea on which the Webster vacuum system of steam heating is based. In the development of this idea, the next step was the use of a restriction on the return side of each radiator—the origin of the radiator trap. This principle was embodied in the Hall patent of 1891 which was likewise acquired by Warren Webster & Company. Since the establishment of his company, these systems have been installed in more than 75,000 buildings.

Last June 23 Mr. Webster was honored at the 50th anniversary celebration of the company. The banquet was attended by three hundred factory and home office employees and sixty district representatives.

Mr. Webster was a member of the Manufacturers' Club and the Penn Athletic Club, of Philadelphia, the Island Heights, N. J., Yacht Club and the St. Petersburg, Fla., Yacht Club. He retired recently from the board of trustees of Cooper Hospital, Camden, a position he held for many years.

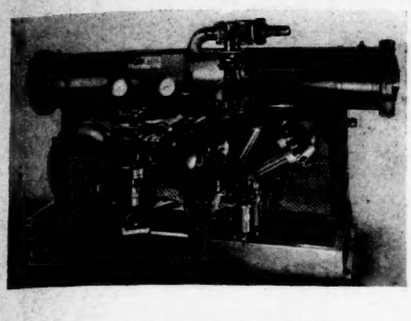
He is survived by his widow, the former Frances M. Siegrist, of Philadelphia; a son, Warren, Jr., of Haddonfield, N. J.; two daughters, Mrs. W. Maynard Brown, of Haddonfield, and Mrs. J. Spencer Lucas, of Philadelphia; eleven grandchildren; a brother, A. Spencer Webster, of Florida and Ocean Gate, N. J., and a sister, Mrs. George H. Musgrave, of Arlington, Mass.

Funeral services were conducted in Camden on December 23.

E. T. Keefe

NEWTON, MASS.—E. T. Keefe, president of Underground-Steam Construction Co., Boston, died at his home here December 1.

NEW EQUIPMENT

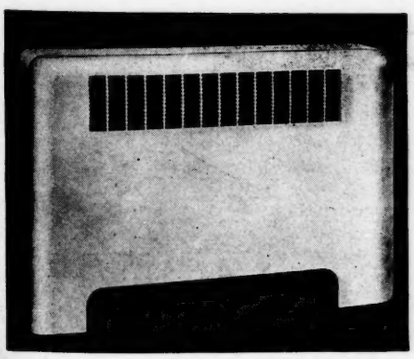


York Condensing Unit

NAME—York Freon condensing systems with 6-cylinder W-type compressor.
PURPOSE—Large capacity condensing units for air conditioning applications.
FEATURES—The compressor in this condensing unit is of an entirely new design which is said to result in reduced operating expense and space requirements. A one-piece casting forms the crankcase of the compressor and houses removable nickel-iron cylinder sleeves which are assembled in three pairs. One pair is set vertically and each of the other two pairs is at an angle of 60° thereto. The manufacturer states that this cylinder arrangement not only provides perfect balance and simplified lubrication and accessibility, but also permits the use of a short-rigid, double-throw crankshaft requiring only two main bearings. It is also said that a standard motor with usual current characteristics can be used on these units.
SIZES AVAILABLE—40 to 175 hp.
MADE BY—*York Ice Machinery Corp., York, Pa.* *1*

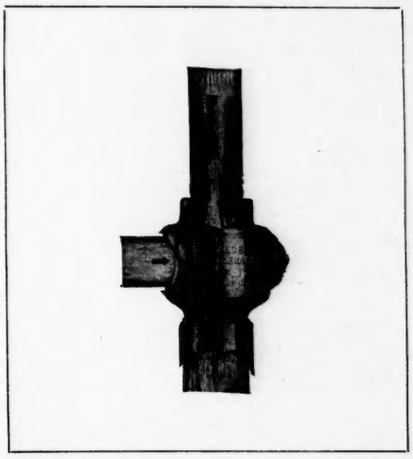
Commodore Convectofin Inclosure

NAME—Modern Style Convectofin.
PURPOSE—A modern inclosure for Convectofin heating convectors.
FEATURES—This inclosure is designed to harmonize with today's room furnishings and decorations and is to be used with the Commodore line of convectors.
MADE BY—*Commodore Heaters Corp., New York, N. Y.* *2*



Albe Circulation Accelerator

NAME—Albe circulation accelerator.
PURPOSE—For increasing the circulation of water in service hot water systems.
FEATURES—The accelerator is connected in the return line from the bottom of the storage tank to the heater or boiler. When a faucet is opened the inlet cold water, because of its high pressure, is forced through a series of nozzles in the accelerator at a high



speed. This high velocity nozzle stream discharging into the throat creates a suction which pulls with it six to ten times as much water from the bottom of the storage tank. This mixture is then pushed through the neck of the accelerator into the heater. It is said that the heat is rapidly absorbed by the accelerated water and is transferred quickly into the tank, avoiding heat dissipation into the cellar and stack.
SIZES—Made in four sizes for tanks from 120 to 5000 gal.
MADE BY—*Albe Pump Corp., Brooklyn, N. Y.* *3*

Universal Duct Booster Fan

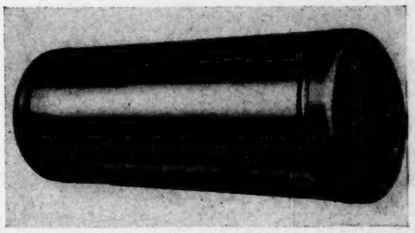
NAME—Universal duct booster fan.
PURPOSE—For converting gravity warm air systems into forced draft.
FEATURES—Device consists of a 110-volt, 50-watt d.c. motor, a quiet-type 12-in. aluminum displacement fan together with electrical connections, supporting bracket, cover plate and a fan switch which automatically turns on the fan when the bonnet temperature reaches 150F and cuts off when it falls to 130F. Fan is said to have a capacity of approximately 45,000 cu. ft. per hr. and is said not to interfere with normal gravity flow when it is shut down.
MADE BY—*Universal Blower Co., Birmingham, Mich.* *4*

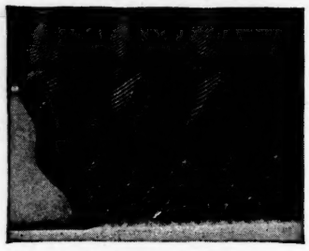
Randall Pillow Block

NAME—Randall one-piece steel housing pillow block.
PURPOSE—A self-aligning, self-lubricating pillow block.
FEATURES—One-piece housing on this block is said to eliminate several parts and effects a great saving in assembly costs, making it possible for this pillow block to be sold at a low price. Block can be mounted in any position by simply unscrewing the oil cup, turning the ball and reinserting the oil cup in a vertical position. The entire assembly is cadmium plated to resist corrosion. This pillow block is interchangeable with all other Randall pillow blocks with the same shaft sizes.
SIZES—Shaft sizes from ½ to 1 in.
MADE BY—*Randall Graphite Products Corp., Chicago, Ill.* *5*

Bell&Gossett Tankless Water Heater

NAME—Bell & Gossett tankless water heater.
PURPOSE—An instantaneous type domestic water heater for utilizing boiler water as a source of heat.
FEATURES—Heater is designed to satisfy the demand for a heater of a high capacity, which can be installed in basements lacking space for storage tanks or where the service water conditions would make it necessary to use copper or other non-ferrous tanks. Only copper and bronze are used in all parts in contact with service water. Coils can be removed by unscrewing the bolts in the head and by loosening the lock nuts. Heating unit is completely enclosed in a steel jacket at slight extra cost.
SIZES AND CAPACITIES—Four sizes with capacities ranging from 140 to 300 g.p.h. with 180 F. boiler water.
MADE BY—*Bell & Gossett Co., Chicago, Ill.* *6*



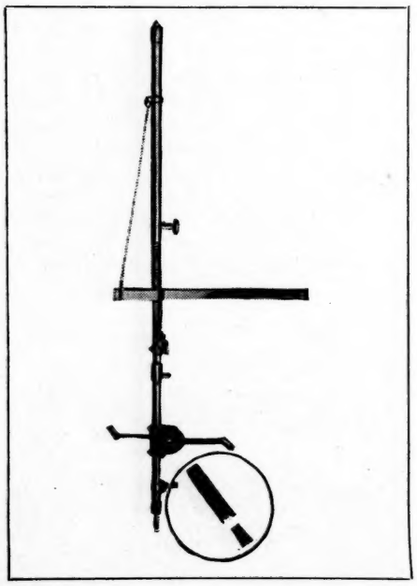


Air-Maze Filter

NAME—Kleenflo.
PURPOSE—A low-cost cleanable air filter panel for air conditioners, room coolers, furnace blower cabinets and window ventilators.
FEATURES—Fillers are constructed of a maze of alternately placed and exactly spaced crimped galvanized wire screens of a selected mesh. These screens are arranged so as to create graduated and progressive density and to embody the baffle-impingement principle of air filtration. Filters may be cleaned by passing them through a pan of hot water or by placing them under a stream of hot water. After the dirt has been removed an oil of 20 viscosity is sprayed on with an insect spray gun. The manufacturer states that the filters have an air cleaning efficiency from 98 to 99.6%.
SIZES—Four standard sizes 20 x 20 in., 20 x 25 in., 16 x 20 in., and 16 x 25 in. Special sizes up to 500 sq. in. for 1-in. thick panels and 600 sq. in. for 2-in. thick panels.
MADE BY—*Air-Maze Corp., Cleveland, Ohio*.....7

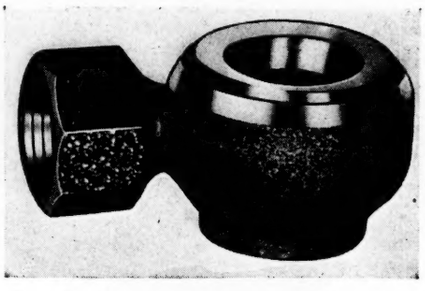
Phillips Spring Hammer

NAME—Phillips spring hammer.
PURPOSE—For drilling upward holes and installing self-drilling expansion shells in concrete ceilings.
FEATURES—This hammer, which is designed primarily as a floor to ceiling tool utilizes a Phillips self-drilling shell which drills its own hole and is then expanded into the hole to make a permanent fixture. According to the manufacturer ⅜ or ½ in. shells can be installed in one minute. Device can be equipped with a power drilling unit or with cranks for manual operation.
MADE BY—*Phillips Drill Co., Chicago, Ill.*.....8



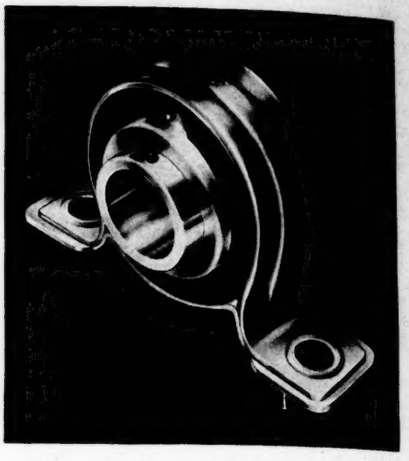
Wide Angle Spray Nozzles

NAME—Parasol non-clogging spray nozzle.
PURPOSE—For use in air conditioning, air washers, air coolers, or wherever a wide spray angle is required.
FEATURES—Spray is of the hollow cone type with a wide spray angle. Nozzles are accurately machined and are available with female pipe connection of ⅛ to ½ in. Standard construction is brass; other materials can be specified.
CAPACITIES—From 0.5 to 4 g.p.m. at 10 lb. pressure.
MADE BY—*Spraying Systems Co., Chicago, Ill.*.....9



SKF Pillow Block

NAME—SKF Rubber Flex pillow block.
PURPOSE—A self-aligning, sound-insulated pillow block for use in applications requiring anti-friction bearings with unusual quiet operating characteristics.
FEATURES—Unit consists of a self-locking bearing of the "grip-lock" type. The manufacturer states that the bearing is inherently aligning, thus compensating for inaccuracies of set-up and conditions of shaft misalignment



without binding or in any way impairing the load-carrying capacity of the bearing. The bearing is encased in a steel housing to exclude dirt. Housing is provided with means for lubricating the bearing. The bearing and housing are surrounded with an elastic material having special sound-absorbing characteristics and the material has been specially treated to make it impervious to oil and grease.
SIZES—¾ and 1 in. shaft sizes.
MADE BY—*SKF Industries, Inc., Philadelphia, Pa.*.....10

American Radiator Humidifier

NAME—Arco humidifier.
PURPOSE—An attachment for heating plants to add moisture to residences during the winter.
FEATURES—Humidifier has a 12-gal. evaporating capacity for each 24 hr. Air is drawn in from the outside or from the basement and moisture is added in a mixing chamber by means of a spray nozzle. Air then passes over a hot evaporator plate where it is tempered, and passes out through an air tube to the discharge grille. A humidistat governs the moisture content of the air. The manufacturer states that the device can be attached to warm water, vapor or steam boilers whether automatic or hand-fired.
MADE BY—*American Radiator Co., New York.*.....11

TO OBTAIN FURTHER INFORMATION ON NEW EQUIPMENT
ANNOUNCED IN JANUARY, 1939

On the list below circle the item number of the equipment in which you are interested, using the number found at the end of each item.

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Degree-Day Figures for November, 1938

HEATING & VENTILATING continues its eleventh year of publishing degree-day data for various large cities

	Albany, N. Y.	Atlanta, Ga.	Baltimore, Md.	Birmingham, Ala.	Boston, Mass.	Buffalo, N. Y.	Burlington, Vt.
Degree-days for November, 1938.....	754	330	449	323	564	650	802
Degree-days, Sept. 1 to Nov. 30, 1938..	1351	427	674	396	973	1198	1576
Degree-days, Sept. 1 to Nov. 30, 1937...	1297	749	863	642	1146	1477	1589
Degree-days, Sept. 1 to Nov. 30, Normal	1292	492	790	318	1104	1268	1486

	Cheyenne, Wyo.	Chicago, Ill.	Cincinnati, Ohio	Cleveland, Ohio	Columbus, Ohio	Denver, Colo.	Des Moines, Iowa
Degree-days for November, 1938.....	1007	648	534	560	593	840	785
Degree-days, Sept. 1 to Nov. 30, 1938..	1632	972	820	940	910	1181	1041
Degree-days, Sept. 1 to Nov. 30, 1937..	1597	1388	1183	1316	1264	1150	1408
Degree-days, Sept. 1 to Nov. 30, Normal	1745	1112	863	1125	1003	1259	1155

	Detroit, Mich.	Dodge City, Kan.	Duluth, Minn.	El Paso, Tex.	Erie, Pa.	Evansville, Ind.	Fort Wayne, Ind.
Degree-days for November, 1938.....	668	708	1141	452	593	480	665
Degree-days, Sept. 1 to Nov. 30, 1938..	1136	875	1850	488	1014	640	1032
Degree-days, Sept. 1 to Nov. 30, 1937..	1495	1007	2147	338	1378	975	1466
Degree-days, Sept. 1 to Nov. 30, Normal	1219	948	1943	421	1125	683	1073

	Fort Worth, Tex.	Grand Rapids, Mich.	Green Bay, Wis.	Harrisburg, Pa.	Hartford, Conn.	Indianapolis, Ind.	Ithaca, N. Y.
Degree-days for November, 1938.....	351	663	829	605	628	579	717
Degree-days, Sept. 1 to Nov. 30, 1938..	386	1075	1324	957	1025	865	1317
Degree-days, Sept. 1 to Nov. 30, 1937..	473	1484	1746	1138	1243	1276	1491
Degree-days, Sept. 1 to Nov. 30, Normal	252	1250	1558	989	1097	985	1325

	Kansas City, Mo.	Knoxville, Tenn.	La Crosse, Wis.	Lansing, Mich.	Lincoln, Neb.	Little Rock, Ark.	Los Angeles, Calif.
Degree-days for November, 1938.....	614	438	880	717	764	416	97
Degree-days, Sept. 1 to Nov. 30, 1938..	775	591	1293	1263	962	491	124
Degree-days, Sept. 1 to Nov. 30, 1937..	1086	899	1657	1650	1224	692	125
Degree-days, Sept. 1 to Nov. 30, Normal	826	702	1467	1456	1069	428	123

	Louisville, Ky.	Madison, Wis.	Memphis, Tenn.	Milwaukee, Wis.	Minneapolis, Minn.	Nashville, Tenn.	New Haven, Conn.
Degree-days for November, 1938.....	496	819	384	732	1005	457	581
Degree-days, Sept. 1 to Nov. 30, 1938..	707	1251	467	1135	1447	588	942
Degree-days, Sept. 1 to Nov. 30, 1937..	1043	1657	700	1525	1731	858	1149
Degree-days, Sept. 1 to Nov. 30, Normal	738	1437	464	1380	1537	619	1092

	New Orleans, La.	New York, N. Y.	Norfolk, Va.	Oklahoma City, Okla.	Omaha, Neb.	Peoria, Ill.	Philadelphia, Pa.
Degree-days for November, 1938.....	186	525	307	508	792	665	498
Degree-days, Sept. 1 to Nov. 30, 1938..	193	796	468	595	1016	952	735
Degree-days, Sept. 1 to Nov. 30, 1937..	287	1000	639	767	1326	1394	954
Degree-days, Sept. 1 to Nov. 30, Normal	102	894	510	564	1109	1173	830

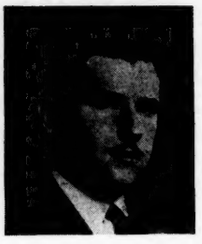
	Pittsburgh, Pa.	Portland, Me.	Portland, Oreg.	Providence, R. I.	Reading, Pa.	Reno, Nev.	Richmond, Va.
Degree-days for November, 1938.....	576	692	607	575	561	822	409
Degree-days, Sept. 1 to Nov. 30, 1938..	911	1258	866	954	894	1315	638
Degree-days, Sept. 1 to Nov. 30, 1937..	1233	1398	733	1183	1064	1011	871
Degree-days, Sept. 1 to Nov. 30, Normal	982	1343	995	1104	1013	1311	641

	Rochester, N. Y.	St. Louis, Mo.	Salt Lake City, Utah	San Francisco, Calif.	Scranton, Pa.	Seattle, Wash.	Spokane, Wash.
Degree-days for November, 1938.....	669	515	926	248	663	590	898
Degree-days, Sept. 1 to Nov. 30, 1938..	1193	667	1238	492	1155	964	1384
Degree-days, Sept. 1 to Nov. 30, 1937..	1454	1025	908	429	1339	882	1262
Degree-days, Sept. 1 to Nov. 30, Normal	1289	802	1129	521	1189	1165	1526

	Springfield, Ill.	Syracuse, N. Y.	Toledo, Ohio	Trenton, N. J.	Utica, N. Y.	Washington, D. C.	Wichita, Kan.
Degree-days for November, 1938.....	593	664	638	563	774	474	637
Degree-days, Sept. 1 to Nov. 30, 1938..	800	1212	1039	878	1379	732	761
Degree-days, Sept. 1 to Nov. 30, 1937..	1226	1362	1423	1067	1453	941	972
Degree-days, Sept. 1 to Nov. 30, Normal	963	1319	1110	830	1393	845	828

Methods of applying the degree-day in connection with the operation of heating plants or for the prediction of fuel consumption of heating plants are described fully in the new enlarged edition of the DEGREE-DAY HANDBOOK, published by HEATING & VENTILATING, 148 Lafayette Street, New York, price $3. Degree-days as given above for a "normal" month or season are based on averages for a long period of years, ending about 1922. Averages covering different periods will disagree with the above figures slightly.

WITH THE MANUFACTURERS



Robert L. Leigh

Air Control Products, Inc., Muskegon, Mich., has been organized to manufacture registers, grilles, damper regulator sets, and other accessories. Production will be under way about February 1. *Robert L. Leigh* has been elected president and general manager. Mr. Leigh was formerly with Hart & Cooley and prior to that was with the Uni-Flo Grille Corp.

American Machine and Metals, Inc., New York, has appointed *A. M. Harp* midwestern district sales manager of its DeBothezat Ventilating Equipment Div., with headquarters at 35 E. Wacker Drive, Chicago.

Carrier Corp., Syracuse, N. Y., has appointed *Conditioning Co., Inc.,* 368 Broad St., Newark, N. J., distributor in the Newark area. *John A. Powell* is president of the Conditioning Co.

Cooling & Heating Supply Co., 364 North High St., Columbus, Ohio, has been formed by *DeWitt H. Wyatt* who has purchased the assets of Cooling & Heating, Inc. from Earl Bougher, receiver. The new supply company will deal primarily in refrigeration, ventilation, and heating products, acting as a manufacturers' agency covering 25 counties in central Ohio. Mr. Wyatt, at one time with the engineering department of Frigidaire, was later with Kelvinator and more recently has done engineering work in Columbus.

Julien P. Friez & Sons, Baltimore, Md., announces the removal of its Boston representative, *Air Conditioning Utilities Co.,* from 110 Arlington St. to larger premises at *436 Statler Building.*

General Gas Light Co., Kalamazoo, Mich., has appointed *Robert E. Polk* Eastern sales manager, with headquarters at 23 Warren St., New York. For a number of years Mr. Polk, as general manager of Equitable Sales Company and utilization sales manager of the Equitable Gas and Duquesne Light of Pittsburgh, was in charge of all appliance merchandising and gas heating sales for those companies.

Worthington Pump and Machinery Corp., Harrison, N. J., has appointed *Walter B. Strong* assistant general sales manager. Formerly manager of the corporation's export division, Mr. Strong will continue general supervision of export sales, and will also be identified with certain phases of domestic sales work. *George Gellhorn, Jr.,* succeeds Mr. Strong as manager of the export division.

Worthington has transferred *Edward Watson,* refrigeration and air conditioning engineer, from the corporation's home office to its Atlanta district sales office at 133 Carnegie Way, Atlanta. Mr. Watson, who will function in North and South Carolina, Georgia, Florida and Alabama, joined the organization when the Carbondale Machine Company became part of Worthington in 1934. During 1936 and the greater part of 1937, he was located in South Africa, engaged in the promotion of the company's equipment there. Since his return, he has been in charge of the industrial refrigeration division.

NEW TRADE LITERATURE

Blow-Off Valves. Two standard-size, 24-page bulletins, No. B-420 and B-430, describing Yarway blow-off valves for steam boilers. Recent changes and improvements in this type of valve are completely covered in these bulletins. Bulletin 430 covers blow-off valves for high pressure boilers for working steam pressures from 400 lb. to 2500 lb. per sq. in., while Bulletin 420 covers blow-off valves for low and medium pressure boilers with steam pressures up to 300 lb. per sq. in. YARNALL-WARING CO., PHILADELPHIA, PA. 12

Controls. A large-size folder, No. G-37, illustrating the complete line of Brown Instrument indicating, recording and controlling instruments for measuring and controlling temperatures, pressures, flows, liquid levels and humidity. Brief descriptions under the instrument illustrations give information on models and operating features. THE BROWN INSTRUMENT CO., PHILADELPHIA, PA. 13

Copper Tubing. A standard-size, 12-page bulletin giving pertinent data and specification material on Revere copper water tube. Presents information on the physical property of copper tubes and types of copper water tubes as well as installation data on pipe sizes for water supply, tables to determine sizes for use in water service lines and standard dimensions, weights and properties. REVERE COPPER AND BRASS CO., NEW YORK. 14

Insulation. A standard-size, 24-page catalog on Corinco insulation products. Presents information on the properties of cork, Corinco corkboard, methods of installing, specifications for insulating walls, floors, roofs, and tanks. Also gives data on heat loss coefficients, pipe coverings for cold lines, insulation of brine coolers and cylindrical tanks, and isolation of machinery. Includes a number of sketches showing method of installation. CORK INSULATION CO., INC., NEW YORK. 15

Unit Heaters. A standard-size, 72-page catalog on Webster-Nesbitt Giant unit heaters. Gives construction information, method of installation, dimensions and basic and extended ratings, together with control and piping diagrams. The capacities of these unit heaters range from 3300 to 16,000 c.f.m. and from 125,000 to 1,008,000 B.t.u. per hr. with 2 lb. steam and 60F entering air. All units may be used on steam pressures up to 200 lb. gage. JOHN J. NESBITT, INC., HOLMESBURG, PHILADELPHIA, PA., and WARREN WEBSTER & CO., CAMDEN, N. J. 16

TO OBTAIN COPIES OF TRADE LITERATURE listed in this issue, circle on the list below the publications wanted, using the item number at the end of each review; fill in your name and address, mail to

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Steel Boilers. A standard-size, loose-leaf, 24-page catalog, No. 80 f, covering the full line of Kewanee steel boilers. Purpose of catalog is to give in compact form complete specification data and information on every size of all models of Kewanee boilers. Also includes descriptive data on Tabasco water heaters and tanks. KEWANEE BOILER CORP., KEWANEE, ILL. 17

Ventilating Ceiling. A standard-size, four-page folder describing the Burgess perforated ventilating ceiling. Gives data on performance and construction. Also shows how the ceiling is installed. C. F. BURGESS LABORATORIES, INC., CHICAGO, ILL. 18

COMING EVENTS

JANUARY 16-19, 1939. Refrigeration and Air Conditioning Exhibition, Stevens Hotel, Chicago. Sponsored by Refrigeration Supplies and Parts Manufacturers Association, 111 W. Washington St., Chicago.

JANUARY 23, 1939. Annual meeting, Industrial Unit Heater Association, William Penn Hotel, Pittsburgh, Pa. L. O. Monroe, Secretary-Treasurer, IUHA, 5-208 General Motors Building, Detroit, Mich.

JANUARY 23-26, 1939. 45th Annual Meeting, American Society of Heating and Ventilating Engineers, William Penn Hotel, Pittsburgh, Pa. ASHVE Headquarters, 51 Madison Ave., New York.

MARCH 8-9, 1939. Conference on Air Conditioning, sponsored by the Department of Mechanical Engineering and the Engineering Experiment Station of the College of Engineering, University of Illinois. Prof. W. H. Severns, Chairman, General Committee, 1939 Conference on Air Conditioning, University of Illinois, Urbana, Ill.

APRIL 28-29, 1939. Second Annual Anthracite Conference, Packard Memorial Hall, Lehigh University, Bethlehem, Pa. Chairman, Committee on Arrangements, Prof. Howard Eckfeldt, Lehigh University.

MAY 22-23, 1939. 26th Spring Meeting, American Society of Refrigerating Engineers, Hotel Hershey, Hershey, Pa. ASRE Headquarters, 37 West 39th St., New York, David L. Fiske, Secretary.

MAY 24-26, 1939. Annual Convention, Association of Gas Appliance and Equipment Manufacturers, Hotel Roosevelt, New York. Association Headquarters, 60 East 42nd St., New York, C. W. Berghorn, Executive Secretary.

MAY 31-JUNE 2, 1939. 50th Annual Convention, Heating, Piping and Air Conditioning Contractors National Association, Drake Hotel, Chicago, Ill. Association headquarters, Room 1401, 1250 Sixth Ave., New York, Joseph C. Fitts, Secretary.

JUNE 13-16, 1939. 33rd Annual Convention of the Smoke Prevention Association, Hotel Schroeder, Milwaukee, Wis. An Exhibit of Fuel-Burning Equipment will be a feature. C. D. Behan, Publicity Director, SPA, City Hall Sq. Bldg., Chicago.

JUNE 27-30, 1939. 30th Annual Convention and Equipment Exhibit, National District Heating Association, Hotel Pennsylvania, New York. Wm. H. Sanford, Secretary-Treasurer, NDHA, 1317 Spruce St., Philadelphia, Pa.

JULY 2-5, 1939. 45th Semi-Annual Meeting American Society of Heating and Ventilating Engineers, Grand Hotel, Mackinac Island, Mich.

OCTOBER 4-6, 1939. Exposition of Building, Industry and Services, Hotel Statler, Detroit, Mich. Sponsored by the Mortgage Bankers Association of America. George H. Patterson, Secretary-Treasurer, 111 West Washington St., Chicago, Ill.

JANUARY 22-26, 1940. 46th Annual Meeting, American Society of Heating and Ventilating Engineers, Cleveland, Ohio. To be held in conjunction with the 6th International Heating and Ventilating Exposition at the Cleveland Public Hall.

JANUARY 23-25, 1940. 35th Annual Meeting, American Society of Refrigerating Engineers, Hotel Cleveland. Cleveland, Ohio.

The "YOUNG" Remote Control Regulator uses a RATCHET

Is Pronounced the LAST WORD in Manual Remote Control

Engineers tell us that the "YOUNG" Remote Control Regulator is the best device for manual control of dampers. Several hundred are used in Building No. 7 of Radio City, and they are specified on many other prominent jobs. They are positive in action because we use a RATCHET; this new principle assures satisfactory performance no matter how far the regulator is from the damper. We do not depend upon the friction in bends to keep the damper in position. The damper is regulated by PULLING ON CABLE—not by PUSHING on a wire. This prevents buckling, breaking, or sticking and ELIMINATES the cause of most of your present trouble. The wire cable may be installed on a STRAIGHT line without bends. The "YOUNG" Remote Control Regulator has been tested by experts and then specified on important jobs. There are many important points that you should know about which are described in our 4-page Bulletin. WRITE FOR IT TODAY.

It will Pay to Check into this for YOUR Next Job

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Patents Pending

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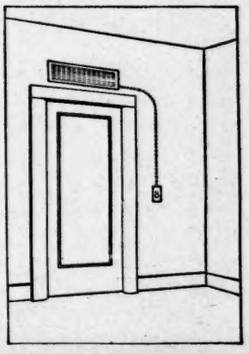

other "YOUNG" Regulators

The "YOUNG" Surface Damper Regulator is made in ⅜ in. size only and has five important features: (1) It locks securely. (2) It is tamper-proof. (3) It gives positive action. (4) It is ornamental,—can be placed on partition walls. (5) It is adjusted and locked with a polygonal wrench or key. We can also supply a Flush Cup Damper Regulator and Concealed Damper Regulator.

The "YOUNG" VALCALOX Regulator can be placed on partition wall or any location of duct. Adjusted and locked with a special wrench. It is much cheaper than the "YOUNG" Regulator.

Write for Further Information

YOUNG REGULATOR CO.

4500 Euclid Ave. Cleveland, Ohio